An Analysis of the Patterns of Economic Growth in the US: Autonomous Demand Components and Their Divergent Multipliers

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Abstract

This contribution seeks to investigate which demand component leads and shapes the patterns of growth of the US economy between 1954-2020 and comprehensive sub-periods relying on a proper allocation of imports based on Akyüz (2011); Zhu and Kotz (2011); and Freitas and Dweck (2013). In doing so, it aims to establish whether the external sector can have a positive contribution to growth even in a context of negative net-exports – as argued by Serrano (2008) and Teixeira (2015). Finally, it seeks to shed light on the reasons for having different multipliers for different demand components. The novelty of this contribution is twofold: i. calculating and analysing the decomposition of the contributions to growth for the US; ii. developing mathematically the growth contributions to take into account the different domestic contents of the different demand components, extending the work of Freitas and Dweck (2013), inspired by Akyüz (2011) and Zhu and Kotz (2011).

Keywords: Growth Decomposition; Supermultiplier; US Economy
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1 Introduction

In the recent period the theories of growth have been revived as a reply to the concerns with secular stagnation (Summers, 2014; Gordon, 2015) in advanced economies. The problem of economic growth is indeed the the corner stone of modern macro, which has been grounded in the seminal work of Robert Solow on Growth Accounting (Solow, 1957).[1] Post-Keynesians have also contributed to the debate discussing demand and growth regimes, that recently took on board the literature on comparative political economy and welfare state models.[2]

As recently emphasized by Stockhammer (2021), post-Keynesian theory can indeed provide key insights on what concerns instability, income distribution, and power relations, which other competing schools have failed to tackle. Nevertheless, the growing literature in recent years on demand-side growth-accounting relies on the concept of net-export, thus failing to distinguish between domestic versus external demand growth (Akyüz, 2011). The concept of net exports is misleading because it mixes a demand component (exports) with a supply component (imports), and this distinction is of fundamental importance. In fact, attributing all imports to the external sector is an over-simplifying assumption that overlooks all the other linkages between imports and the other components of aggregate demand. As highlighted by Akyüz (2011), this results in underestimating the contribution of exports while overestimating the contribution of every other demand component.

Whereas it is appropriate to think in terms of external balance in some countries, considering the US economy, this is not so accurate. This so because the US is so far the only country in the world that does not have an external restriction. Moreover, as argued by Serrano (2008) and Teixeira (2015), even with negative net-exports the external sector can contribute positively to demand growth. This result can be explained if and only if imports are allocated properly when performing the exercise of calculating the contribution of each aggregate demand component relying on national growth accounting and on the methodological hints provided by Akyüz (2011) and Freitas and Dweck (2013).

Accordingly, this contribution seeks to investigate which demand component leads and shapes the patterns of growth of the US economy between 1954-2020 and comprehensive sub-periods relying on a proper allocation of imports based on Akyüz (2011); Zhu and Kotz (2011); and Freitas and Dweck (2013). In doing so, it aims to establish whether the external sector can have a positive contribution to growth even in a context of negative net-exports – as argued by Serrano (2008) and Teixeira (2015). Finally, it seeks to shed light on the reasons for having different multipliers for different demand components.

The novelty of this contribution is twofold: i. calculating and analysing the decomposition of the contributions to growth for the US based on Freitas and Dweck (2013); ii. developing mathematically the growth contributions to take into account the different domestic contents of the different demand components, extending the work of Freitas and Dweck (2013), inspired by Akyüz (2011) and Zhu and Kotz (2011).

The remainder of this paper is organized as follows. Section (2) presents data and methodologies used to perform the analysis of the decomposition of the contributions to growth. Section (3) presents the results of the decomposition of the contributions to growth.Section (4) concludes drawing some

[1]For a critique of the Solow model and its implications as regards absolute and conditional convergence around productivity growth rates and growth paths see Hein (2014, p.73).

[2]The interested reader might refer to Hein and Martschin (2021) for an in-depth review of the post-Keynesian contributions to growth regimes.

policy implications.

2 Data and Methodology

In this Section the data used in the calculations of the quarterly average growth decomposition is presented (Subsection 2.1), followed by a discussion of the methodology employed (Subsection 2.2).

2.1 Data

In order to calculate the average quarterly rate of growth decomposition for the US economy and assess the patterns of growth in the different sub-periods, this contribution relies on time-series quarterly data (1954-2020) provided by the Bureau of Economic Analysis.[3] In particular, the data is build using the National Income and Product Accounts to obtain the share of domestic content in demand (μ)[4] subtracting from 1 total imports as share of total aggregate demand, exports of goods and services (X), government expenditures (G), private residential investment (RES), personal consumption expenditures in services and non-durable goods (C), private non-residential fixed investment (I), change in private inventories (E), and personal consumption expenditures in durable goods (DC). All variables are deflated using the GDP deflator in order to maintain the additive property of the National Accounts data. Considered variables are summarized in table (1) and Appendix (A).

Table (1) **Variables:** Description and Acronyms

Acronyms	Variables
μ	Share of Domestic Content in Demand
X	Exports of Goods and Services
G	Government Expenditure
RES	Private Residential Investment
DC	Personal Consumption Expenditures in Durable Goods
C	Personal Consumption Expenditures in Non-durable Goods and Services
I	Private Fixed Investment (Non-Residential)
E	Change in Private Inventories
Y	GDP

2.2 Methodology

In order to calculate the quarterly average growth decomposition for the US economy for the period (1954-2020) and comprehensive sub-periods, we follow Freitas and Dweck (2013). The development of the model using the variables under scrutiny follows bellow.

[3] Spinato Morlin et al. (2021) perform a similar exercise for the US, Japan, Sweden, and Germany, relying on annual data for the period between 2000-2017, however they do not consider durable consumption as one of the components of autonomous demand constrained by data availability on the group of countries analysed. The authors also advocate that the SSM approach could profit from the discussion of comparative political economy, which could shed lights on the political and social aspects that determine growth in the long run.

[4] Alternatively one could consider a different μ for each demand component as mathematically shown in Section (2.2). However, this would require using industry level data. In order to keep our empirical analysis simple, only aggregate imports are used. This is the same as assuming that every demand component has the same domestic content. The draw-back of this exercise is over estimating the growth contribution of demand components that have a lower domestic content than the aggregate one and vice-versa.

Equation (1) represents the identity between aggregate supply and aggregate demand.

$$Y + M = C + I + X + G + RES + DC + E \tag{1}$$

If we assume that total imports are simply a share of total aggregate demand, we can represent the total propensity to import as the complement of the domestic content in aggregate demand (i.e. $1 - -\mu$) as follows.

$$M = (1 - \mu)[C + I + X + G + RES + DC + E] \tag{2}$$

Logically, the domestic content of total aggregate demand can be represented as in equation (3). Where μ is the coefficient that represents the domestic content of demand.

$$Y = \mu(C + I + X + G + RES + DC + E) \tag{3}$$

Private consumption (C) is represented as a fraction c (propensity to consume) of total output (Y).

$$C = cY \tag{4}$$

Private non-residential investment (I) is also represented as a fraction h of total output, with h representing the propensity to invest of firms.

$$I = hY \tag{5}$$

Total autonomous demand (Z) is simply the sum of all components of aggregate demand that do not depend on current income and that do not create capacity (i.e. exports – X, government consumption and investment expenditures -G, private residential investment -RES, and private consumption of durable goods-DC).

$$Z = X + G + RES + DC \tag{6}$$

If we plug equations (4, 5, and 6) in equation (2) we obtain equation (7), which, isolating Y, represents total output as the product of the supermultiplier ($\frac{\mu}{(1-\mu c-\mu h)}$) by the sum of total autonomous demand and the change in private inventories ($Z+E$).

$$Y = \mu(cY + hY + Z + E) = \mu cY + \mu hY + \mu Z + \mu E$$
$$\Rightarrow Y\left(1 - \mu c - \mu h\right) = \mu\left(Z + E\right) \Rightarrow Y = \frac{\mu}{(1 - \mu c - \mu h)}\left(Z + E\right) \quad (7)$$

In order to consider the effect of the variation of each component on the total variation of output, we subtract from each component at time one -$_{(1)}$- the same component at time zero -$_{(0)}$.

$$Y_{(1)} - Y_{(0)} = \mu_{(1)}c_{(1)}Y_{(1)} - \mu_{(0)}c_{(0)}Y_{(0)} + \mu_{(1)}h_{(1)}Y_{(1)} - \mu_{(0)}h_{(0)}Y_{(0)} +$$
$$+ \mu_{(1)}Z_{(1)} - \mu_{(0)}Z_{(0)} + \mu_{(1)}E_{(1)} - \mu_{(0)}E_{(0)} \quad (8)$$

Since $Y_{(1)} - Y_{(0)} = \Delta Y = gY_{(0)}$, we can re-write equation (8) as follows:

$$gY_{(0)} = \mu_{(1)}c_{(1)}gY_{(0)} + \mu_{(1)}h_{(1)}gY_{(0)} + [\mu_{(1)}c_{(1)} - \mu_{(0)}c_{(0)}]Y_{(0)} +$$
$$+ [\mu_{(1)}h_{(1)} - \mu_{(0)}h_{(0)}]Y_{(0)} + \mu_{(1)}\Delta Z + \Delta\mu Z_{(0)} + \mu_{(1)}\Delta E + \Delta\mu E_{(0)} \quad (9)$$

Dividing both sides by $Y_{(0)}$ we obtain:

$$g = \mu_{(1)}c_{(1)}g + \mu_{(1)}h_{(1)}g + \mu_{(1)}c_{(1)} - \mu_{(0)}c_{(0)} + \mu_{(1)}h_{(1)} - \mu_{(0)}h_{(0)} +$$
$$+ \mu_{(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu\frac{Z_{(0)}}{Y_{(0)}} + \mu_{(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu\frac{E_{(0)}}{Y_{(0)}} \quad (10)$$

Summing and subtracting $\mu_{(1)}c_{(0)}$ and $\mu_{(1)}h_{(0)}$ from equation (10) we have:

$$
\begin{aligned}
g = \mu_{(1)}c_{(1)}g + \mu_{(1)}h_{(1)}g + \mu_{(1)}c_{(1)} - \mu_{(1)}c_{(0)} + \mu_{(1)}c_{(0)} - \mu_{(0)}c_{(0)} + \mu_{(1)}h_{(1)} - \mu_{(1)}h_{(0)} + \\
+ \mu_{(1)}h_{(0)} - \mu_{(0)}h_{(0)} + \mu_{(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu\frac{Z_{(0)}}{Y_{(0)}} + \mu_{(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu\frac{E_{(0)}}{Y_{(0)}} \\
\Rightarrow g = \mu_{(1)}c_{(1)}g + \mu_{(1)}h_{(1)}g + \mu_{(1)}\Delta c + \Delta\mu c_{(0)} + \mu_{(1)}\Delta h + \Delta\mu h_{(0)} + \\
+ \mu_{(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu\frac{Z_{(0)}}{Y_{(0)}} + \mu_{(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu\frac{E_{(0)}}{Y_{(0)}}
\end{aligned}
\tag{11}
$$

Solving for the growth rate (g) we get to equation (12).

$$
\begin{aligned}
g(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)}) = \mu_{(1)}\Delta c + \Delta\mu c_{(0)} + \mu_{(1)}\Delta h + \Delta\mu h_{(0)} + \\
+ \mu_{(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu\frac{Z_{(0)}}{Y_{(0)}} + \mu_{(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu\frac{E_{(0)}}{Y_{(0)}} \\
\Rightarrow g = \frac{\mu_{(1)}\Delta c}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})} + \frac{\Delta\mu c_{(0)}}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})} + \frac{\mu_{(1)}\Delta h}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})} + \\
+ \frac{\Delta\mu h_{(0)}}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})} + \frac{\mu_{(1)}}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})}\frac{\Delta Z}{Y_{(0)}} + \frac{\Delta\mu}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})}\frac{Z_{(0)}}{Y_{(0)}} + \\
+ \frac{\mu_{(1)}}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})}\frac{\Delta E}{Y_{(0)}} + \frac{\Delta\mu}{(1 - \mu_{(1)}c_{(1)} - \mu_{(1)}h_{(1)})}\frac{E_{(0)}}{Y_{(0)}}
\end{aligned}
\tag{12}
$$

In order to simplify our expression we can substitute $\frac{\mu_{(1)}}{(1-\mu_{(1)}c_{(1)}-\mu_{(1)}h_{(1)})}$ with $\alpha_{(1)}$ (which we can call the supermultiplier), and $\frac{1}{(1-\mu_{(1)}c_{(1)}-\mu_{(1)}h_{(1)})}$ with $\frac{\alpha_{(1)}}{\mu_{(1)}}$ (the supermultiplier divided by the domestic content in total demand) as follows:

$$
\begin{aligned}
g = \alpha_{(1)}\Delta c + \frac{\alpha_{(1)}}{\mu_{(1)}}\Delta\mu c_{(0)} + \alpha_{(1)}\Delta h + \frac{\alpha_{(1)}}{\mu_{(1)}}\Delta\mu h_{(0)} + \alpha_{(1)}\frac{\Delta Z}{Y_{(0)}} + \frac{\alpha_{(1)}}{\mu_{(1)}}\Delta\mu\frac{Z_0}{Y_{(0)}} + \\
+ \alpha_{(1)}\frac{\Delta E}{Y_{(0)}} + \frac{\alpha_{(1)}}{\mu_{(1)}}\Delta\mu\frac{E_0}{Y_{(0)}}
\end{aligned}
\tag{13}
$$

Collecting $\alpha_{(1)}$ and $\frac{\alpha_{(1)}}{\mu_{(1)}}\Delta\mu$, and substituting ΔZ with $\Delta X + \Delta G + \Delta RES + \Delta DC$ we obtain:

$$
\begin{aligned}
g = \alpha_{(1)}\left[\Delta c + \Delta h + \frac{\Delta X + \Delta G + \Delta RES + \Delta DC}{Y_{(0)}} + \frac{\Delta E}{Y_{(0)}}\right] + \\
+ \frac{\alpha_{(1)}}{\mu_{(1)}}\Delta\mu\left[c_{(0)} + h_{(0)} + \frac{Z_{(0)}}{Y_{(0)}} + \frac{E_{(0)}}{Y_{(0)}}\right]
\end{aligned}
\tag{14}
$$

Recalling that $\Delta x = g_x x_{(0)}$, we can re-write equation (14) substituting the variation of each component by its growth rate multiplied by their own value at time zero.

$$g = \alpha_{(1)} g_c c_{(1)} + \alpha_{(1)} g_h h_{(0)} + \alpha_{(1)} \left[\frac{g_X X_{(0)} + g_G G_{(0)} + g_{RES} RES_{(0)} + g_{DC} DC_{(0)}}{Y_{(0)}} \right] + \\ + \alpha_{(1)} \left[\frac{g_E E_{(0)}}{Y_{(0)}} \right] + \frac{\alpha_{(1)}}{\mu_{(1)}} g_\mu \left[\frac{\mu_{(0)} \left(c_{(0)} Y_{(0)} + h_{(0)} Y_{(0)} + Z_{(0)} + E_{(0)} \right)}{Y_{(0)}} \right] \quad (15)$$

Since $Y_{(0)} = \mu_{(0)} \left[c_{(0) Y_{(0)} + h_{(0)} Y_{(0)} + Z_{(0)}} \right]$ we can re-write equation (15) as follows and obtain our final expression to calculate the growth decomposition of total output.

$$g = \alpha_{(1)} g_c c_{(0)} + \alpha_{(1)} g_h h_{(0)} + \\ + \alpha_{(1)} g_X \frac{X_{(0)}}{Y_{(0)}} + \alpha_{(1)} g_G \frac{G_{(0)}}{Y_{(0)}} + \alpha_{(1)} g_{RES} \frac{RES_{(0)}}{Y_{(0)}} + \alpha_{(1)} g_{DC} \frac{DC_{(0)}}{Y_{(0)}} + \alpha_{(1)} g_E \frac{E_{(0)}}{Y_{(0)}} + \frac{\alpha_{(1)}}{\mu_{(1)}} g_\mu \quad (16)$$

It is easy to capture that, according to this expression each autonomous component of demand's contribution depends on the components share with respect to total output, its respective growth rate, and the supermultiplier (α_1), which is the same for every component. This would be the case if and only if three conditions apply at the same time.

First, if all demand components had the same imported input coefficient, defined as the share of imported goods of each component considering all "imported intermediate goods through all of the successive stages of production including the final disposition of all relevant goods" (Zhu and Kotz, 2011, p.12). In this rather limiting case, the coefficient would be equal to the overall propensity to import m for all demand components. Alternatively, we can rewrite equation (2) with total imports as the sum of the complements of the domestic component in each demand component multiplied by the respective component as bellow:

$$M = (1 - \mu_{Total}) (C + I + X + G + RES + DC + E) \\ = (1 - \mu_C) C + (1 - \mu_I) I + \\ + (1 - \mu_X) X + (1 - \mu_G) G + (1 - \mu_{RES}) RES + (1 - \mu_{DC}) DC + (1 - \mu_E) E \quad (17)$$

Logically, total domestic demand can be represented simply as the product of the total domestic content of demand by the sum of all aggregate demand components. Alternatively, we can consider the sum of the products of each demand component by its domestic content as bellow:

$$Y = \mu_{Total}\left(C + I + X + G + RES + DC + E\right)$$
$$= \mu_C C + \mu_I I + \mu_X X + \mu_G G + \mu_{RES} RES + \mu_{DC} DC + \mu_E E \quad (18)$$

Private consumption (C) is represented ad a fraction c (propensity to consume) of total output (Y).

$$C = cY \quad (19)$$

Private non-residential investment (I) is also represented as a fraction h of total output and total autonomous demand (Z) is simply the sum of all components of aggregate demand that do not depend on current income and that do not create capacity with.

$$I = hY \quad (20)$$

$$Z = X + G + RES + DC \quad (21)$$

If we plug equations (19, 20, and 21) in equation (18), we obtain equation (22):

$$Y = \mu_C cY + \mu_I hY + \mu_X X + \mu_G G + \mu_{RES} RES + \mu_{DC} DC + \mu_E E \quad (22)$$

Isolating Y we can also re-write equation (22) as follows:

$$Y = \frac{1}{(1 - \mu_C cY - \mu_I hY)}\left(\mu_X X + \mu_G G + \mu_{RES} RES + \mu_{DC} DC \mu_E E\right) \quad (23)$$

In order to consider the contribution of the variation of each component on the variation of total output we simply take the change in each variable from period (0) to period (1), as before.

$$Y_{(1)} - Y_{(0)} = \mu_{C(1)}c_{(1)}Y_{(1)} - \mu_{C(0)}c_{(0)}Y_{(0)} + \mu_{I(1)}h_{(1)}Y_{(1)} - \mu_{I(0)}h_{(0)}Y_{(0)} + \\ + \mu_{Z(1)}Z_{(1)} - \mu_{Z(0)}Z_{(0)} + \mu_{E(1)}E_{(1)} - \mu_{E(0)}E_{(0)} \quad (24)$$

Since $Y_{(1)} - Y_{(0)} = \Delta Y = g_Y Y_{(0)} = gY_{(0)}$, we can rewrite equation (24) as follows:

$$gY_{(0)} = \mu_{(C(1))}c_{(1)}g + \mu_{I(1)}gY_{(0)} + \left[\mu_{C(1)}c_{(1)} - \mu_{C(0)}c_{(0)}\right]Y_{(0)} + \left[\mu_{I(1)}h_{(1)} - \mu_{I(0)}h_{(0)}\right]Y_{(0)} + \\ + \mu_{Z(1)}Z_{(1)} - \mu_{Z(0)}Z_{(0)} + \mu_{E(1)}E_{(1)} - \mu_{E(0)}E_{(0)} \quad (25)$$

Adding and subtracting $\mu_{Z(1)}Z_{(0)}$ and $\mu_{E(1)}E_{(0)}$ from equation (25) we get:

$$gY_{(0)} = \mu_{(C(1))}c_{(1)}g + \mu_{I(1)}gY_{(0)} + \left[\mu_{C(1)}c_{(1)} - \mu_{C(0)}c_{(0)}\right]Y_{(0)} + \left[\mu_{I(1)}h_{(1)} - \mu_{I(0)}h_{(0)}\right]Y_{(0)} + \\ + \mu_{Z(1)}Z_{(1)} - \mu_{Z(1)}Z_{(0)} + \mu_{Z(1)}Z_{(0)} - \mu_{Z(0)}Z_{(0)} + \mu_{E(1)}E_{(1)} - \mu_{E(1)}E_{(0)} + \mu_{E(1)}E_{(0)} - \mu_{E(0)}E_{(0)} \\ \Rightarrow gY_{(0)} = \mu_{(C(1))}c_{(1)}g + \mu_{I(1)}gY_{(0)} + \left[\mu_{C(1)}c_{(1)} - \mu_{C(0)}c_{(0)}\right]Y_{(0)} + \left[\mu_{I(1)}h_{(1)} - \mu_{I(0)}h_{(0)}\right]Y_{(0)} + \\ + \mu_{Z(1)}\Delta Z + \Delta\mu_Z Z_{(0)} + \mu_{E(1)}\Delta E + \Delta\mu_E E_{(0)} \quad (26)$$

Dividing both sides by $Y_{(0)}$:

$$g = \mu_{C(1)}c_{(1)}g + \mu_{I(1)}h_{(1)}g + \mu_{C(1)}c_{(1)} - \mu_{C(0)}c_{(0)} + \mu_{I(1)}h_{(1)} - \mu_{I(0)}h_{(0)} + \\ + \mu_{Z(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}} + \mu_{E(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu_E\frac{E_{(0)}}{Y_{(0)}} \quad (27)$$

Adding and subtracting $\mu_{C(1)}c_{(0)}$ and $\mu_{I(1)}h_{(0)}$ from equation (27) we get:

$$g = \mu_{C(1)}c_{(1)}g + \mu_{I(1)}h_{(1)}g + \mu_{C(1)}c_{(1)} - \mu_{C(1)}c_{(0)} + \mu_{C(1)}c_{(0)} - \mu_{C(0)}c_{(0)} + \mu_{I(1)}h_{(1)} - \mu_{I(1)}h_{(0)} + \\ + \mu_{I(1)}h_{(0)} - \mu_{I(0)}h_{(0)} + + \mu_{Z(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}} + \mu_{E(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu_E\frac{E_{(0)}}{Y_{(0)}} \\ \Rightarrow g = \mu_{C(1)}c_{(1)}g + \mu_{I(1)}h_{(1)}g + \mu_{C(1)}\Delta c + \Delta\mu_C c_{(0)} + \mu_{I(1)}\Delta h + \Delta\mu_I h_{(0)} + \\ + \mu_{Z(1)}\frac{\Delta Z}{Y_{(0)}} + \Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}} + \mu_{E(1)}\frac{\Delta E}{Y_{(0)}} + \Delta\mu_E\frac{E_{(0)}}{Y_{(0)}} \quad (28)$$

Solving for the growth rate isolating g on the left side we obtain:

$$g\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)=\mu_{C(1)}\Delta c+\Delta\mu_C c_{(0)}+\mu_{I(1)}\Delta h+\Delta\mu_h h_{(0)}+$$
$$+\mu_{Z(1)}\frac{\Delta Z}{Y_{(0)}}+\Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}}+\mu_{E(1)}\frac{\Delta E}{Y_{(0)}}+\Delta\mu_E\frac{E_{(0)}}{Y_{(0)}}$$
$$\Rightarrow g=\frac{1}{\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)}$$
$$\left[\mu_{C(1)}\Delta c+\Delta\mu_C c_{(0)}+\mu_{I(1)}\Delta h+\Delta\mu_I h_{(0)}+\mu_{Z(1)}\frac{\Delta Z}{Y_{(0)}}+\Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}}+\mu_{E(1)}\frac{\Delta E}{Y_{(0)}}+\Delta\mu_E\frac{E_{(0)}}{Y_{(0)}}\right] \quad (29)$$

Considering that $\alpha_{C(1)}=\frac{\mu_{C(1)}}{\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)}$, we can re-write equation (29) as follows:

$$g=\alpha_{C(1)}\Delta c+\frac{\alpha_{C(1)}}{\mu_{C(1)}}\Delta\mu_C c_{(0)}+\alpha_{I(1)}\Delta h+\frac{\alpha_{I(1)}}{\mu_{I(1)}}\Delta\mu_I h_{(0)}+$$
$$+\alpha_{Z(1)}\frac{\Delta Z}{Y_{(0)}}+\frac{\alpha_{Z(1)}}{\mu_{Z(1)}}\Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}}+\alpha_{E(1)}\frac{\Delta E}{Y_{(0)}}+\frac{\alpha_{E(1)}}{\mu_{E(1)}}\Delta\mu_E\frac{E_{(0)}}{Y_{(0)}} \quad (30)$$

Collecting the terms where $\Delta\mu$ appears and highlighting $\frac{1}{\left(1-\mu_{C(1)}c_{(1)}--\mu_{I(1)}h_{(1)}\right)}$, we obtain:

$$g=\alpha_{C(1)}\Delta c+\alpha_{I(1)}\Delta h+\alpha_{Z(1)}\frac{\Delta Z}{Y_{(0)}}+\alpha_{E(1)}\frac{\Delta E}{Y_{(0)}}+$$
$$+\frac{\alpha_{C(1)}}{\mu_{C(1)}}\Delta\mu_C c_{(0)}+\frac{\alpha_{I(1)}}{\mu_{I(1)}}\Delta\mu_h h_{(0)}+\frac{\alpha_{Z(1)}}{\mu_{Z(1)}}\Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}}+\frac{\alpha_{E(1)}}{\mu_{E(1)}}\Delta\mu_E\frac{E_{(0)}}{Y_{(0)}}$$
$$\Rightarrow g=\frac{1}{\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)}\left[\mu_{C(1)}\Delta c+\mu_{I(1)}\Delta h+\mu_{Z(1)}\frac{\Delta Z}{Y_{(0)}}+\mu_{E(1)}\frac{\Delta E}{Y_{(0)}}\right]+$$
$$+\frac{1}{\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)}\left[\Delta\mu_C c_{(0)}+\Delta\mu_I h_{(0)}+\Delta\mu_Z\frac{Z_{(0)}}{Y_{(0)}}+\Delta\mu_E\frac{E_{(0)}}{Y_{(0)}}\right] \quad (31)$$

Substituting $\Delta\mu$ with $g_\mu\mu_{(0)}$, we get:

$$g=\frac{1}{\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)}\left[\mu_{C(1)}g_c c_{(0)}+\mu_{I(1)}g_h h_{(0)}+\mu_{Z(1)}g_Z\frac{Z_{(0)}}{Y_{(0)}}+\mu_{E(1)}g_E\frac{E_{(0)}}{Y_{(0)}}\right]+$$
$$+\frac{1}{\left(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)}\right)}\left[g_{\mu_C}\mu_{C(0)}c_{(0)}+g_{\mu_I}\mu_{I(0)}h_{(0)}+g_{\mu_Z}\mu_{Z(0)}\frac{Z_{(0)}}{Y_{(0)}}+g_{\mu_E}\mu_{E(0)}\frac{E_{(0)}}{Y_{(0)}}\right] \quad (32)$$

Putting all terms within the second square brackets on the same denominator ($Y_{(0)}$), we obtain:

$$g = \frac{1}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})}\left[\mu_{C(1)}g_c c_{(0)} + \mu_{I(1)}g_h h_{(0)} + \mu_{Z(1)}g_Z\frac{Z_{(0)}}{Y_{(0)}} + \mu_{E(1)}g_E\frac{E_{(0)}}{Y_{(0)}}\right] + \\ + \frac{1}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})} \\ \left[\frac{g_{\mu_C}\mu_{C(0)}c_{(0)}Y_{(0)}}{Y_{(0)}} + \frac{g_{\mu_I}\mu_{I(0)}h_{(0)}Y_{(0)}}{Y_{(0)}} + \frac{g_{\mu_Z}\mu_{Z(0)}Z_{(0)}}{Y_{(0)}} + \frac{g_{\mu_E}\mu_{E(0)}E_{(0)}}{Y_{(0)}}\right] \tag{33}$$

Since $\left[\frac{g_{\mu_C}\mu_{C(0)}c_{(0)}Y_{(0)}}{Y_{(0)}} + \frac{g_{\mu_I}\mu_{I(0)}h_{(0)}Y_{(0)}}{Y_{(0)}} + \frac{g_{\mu_Z}\mu_{Z(0)}Z_{(0)}}{Y_{(0)}} + \frac{g_{\mu_E}\mu_{E(0)}E_{(0)}}{Y_{(0)}}\right] = g_{\mu_{Total}}$, we can re-write equation (33) as follows:

$$g = \frac{\mu_{C(1)}}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})}g_c c_{(0)} + \frac{\mu_{I(1)}}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})}g_h h_{(0)} + \\ + \frac{\mu_{Z(1)}}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})}g_Z\frac{Z_{(0)}}{Y_{(0)}} + \frac{\mu_{E(1)}}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})}g_E\frac{E_{(0)}}{Y_{(0)}} + \\ + \frac{g_{\mu_{Total}}}{(1-\mu_{C(1)}c_{(1)}-\mu_{I(1)}h_{(1)})} \tag{34}$$

In order to consider the different domestic content coefficients of each demand component as shown in the previous calculations, would require using input-output tables. We acknowledge that this methodology has been used in few recent studies (see, among others, Akyüz, 2011; Zhu and Kotz, 2011, that investigate the growth patterns of China, and Fevereiro and Passoni (2018), that study the case of Brazil relying on the SSM framework). In fact, using input-output data it is possible to properly assess the role of supply chains and the external sector without loosing the additive property of national growth accounting.

However, even if such methodology allows for the consideration of a different μ for each demand component, it implies neglecting the different distribution and investment effects that are captured by different c and h. In fact, the second condition for the multipliers to be equal is that all demand components have the same distribution of income engendered by its underlying income generating process. And, the third condition is that all demand components engender the same adjustment of the investment share.

For this reason, it is possible to argue that depending on the aspect that one wishes to look at considering the patterns of growth, one should choose either input-output analysis or econometric estimation techniques to pin down the three conditions together.[5]

[5]We leave the exploration of input-output data for further developments of the present work.

3 Empirical Findings

This Section presents and analyses the results of the decomposition of the contributions to growth using the methodology introduced by Freitas and Dweck (2013) in Subsection (2.2). To facilitate the comprehension of the results, table (2) clarifies the calculations underlying the % value in each cell which is retrieved from equation (16).

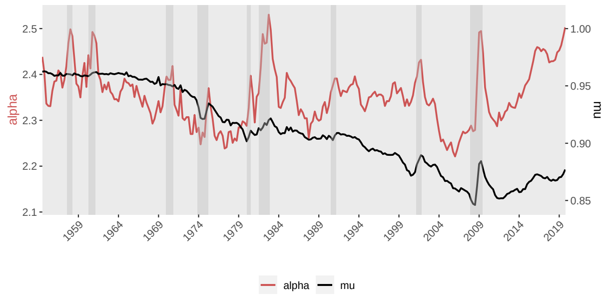
Table (2) **Methodology**

Variables	**External Sector**	**Domestic Sector**		**Inventory Change**	**Total**
		Public	**Private**		
μ	$\frac{\alpha_{(1)}}{\mu_{(1)}} g_\mu$				μ
X	$\alpha_{(1)} \frac{X_{(0)}}{Y_{(0)}} g_X$				X
G		$\alpha_{(1)} \frac{G_{(0)}}{Y_{(0)}} g_G$			G
RES			$\alpha_{(1)} \frac{RES_{(0)}}{Y_{(0)}} g_{RES}$		RES
DC			$\alpha_{(1)} \frac{DC_{(0)}}{Y_{(0)}} g_{DC}$		DC
C			$\alpha_{(1)} c_{(0)} g_c$		C
I			$\alpha_{(1)} h_{(0)} g_h$		I
E				$\alpha_{(1)} \frac{E_{(0)}}{Y_{(0)}} g_E$	E
Total	$\sum \mu, X$	G	$\sum RES, DC, C, I$	E	$\sum$

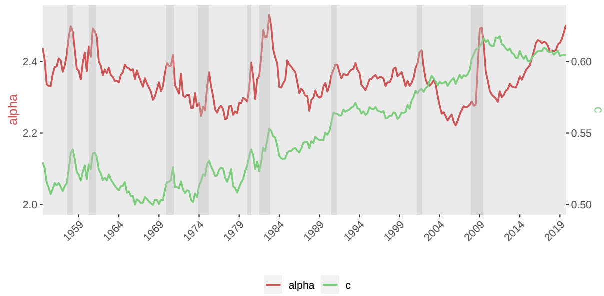
Source: Author's elaboration based on Freitas and Dweck (2013).

Before calculating the average contributions to growth it is worth illustrating the three components responsible for growth mentioned above: i. the multiplier; ii. the growth rates; iii. the components' share. Figure (1), for instance, shows the evolution of the multiplier throughout the period 1954-2020 compared to the evolution of the domestic content of aggregate demand (μ) – figure (1a); to the investment share (h) – figure (1b); and to the propensity to consume (c) – figure (1c). It is clear from figure (1a) that the domestic content of demand (μ) has been characterised by a decreasing trend from the 1960s until the Great Financial Crisis, when it started to recover, going back to its 2004 level. In fact, the significant decrease in the domestic content of aggregate demand has contributed to an overall decrease in the multiplier, which was later compensated by the propensity to consume. As illustrated in figure (1c), the propensity to consume has significantly risen from the end of the 1960s until the crisis, compensating the fall in the domestic content of demand. Finally, figure (1b) shows that the investment share has only shown a significant increasing trend from the 1960s until mid-1980s latter on fluctuating within a narrow band (0.11-0.15) and never recovering from the fall after the recession caused by the burst of the dot-com bubble.

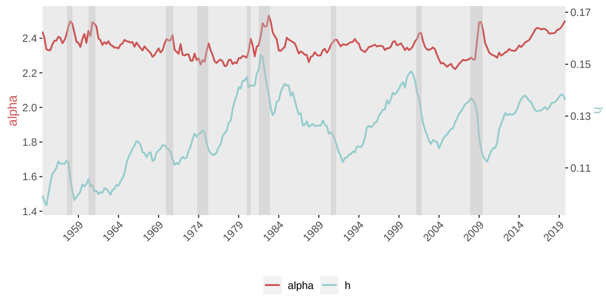
Figure (1) **The Multiplier:** The Evolution of μ, h, and C compared to α in the 1954-2020 period



(a) α and μ



(c) α and c

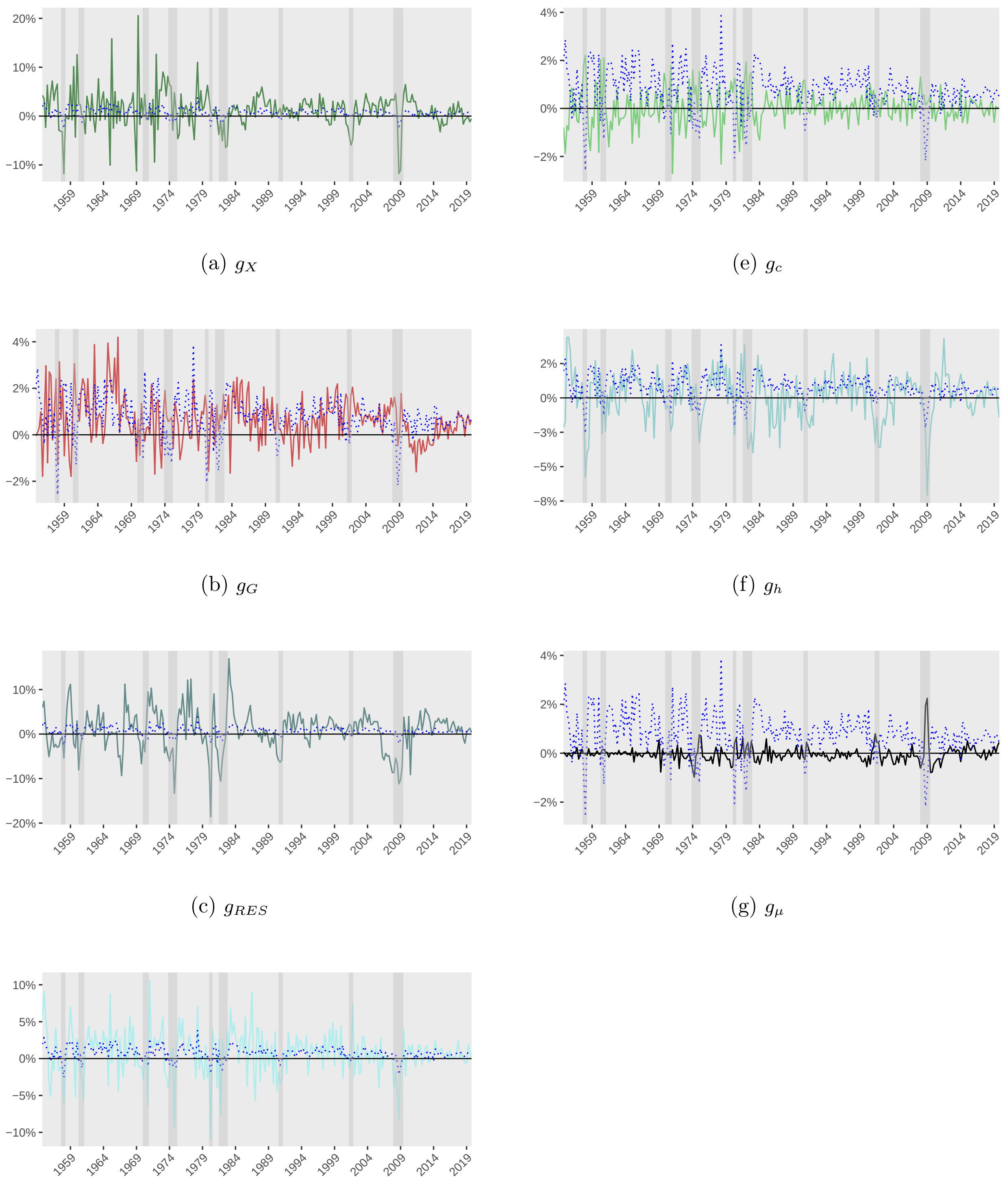


(b) α and h

Source: Author's representation, BEA data.

Analysing figure (2), it is harder to capture the overall effect on output growth for a given period of time. However, some interesting hints emerge. The first one is the fact that the growth rate of exports (g_X) has been positive since mid-1980s having two period of sharp fall in the recession triggered by the dot-com bubble and the Great Financial Crisis. On the contrary, the growth rate of government expenditures (g_G) has been mostly positive from mid-1950s until end of the 1960s, having important negative growth rates after 2009. As regards the components of the multiplier, it is clear that from the mid-1980s until the recent crisis, the growth rate of the propensity to consume (g_c) has mostly remained in the positive territory, whereas the growth rate of domestic content of demand (g_μ) has been on the negative quadrant (with the exception of the recession periods, when imports tend to decrease). It is important to stress that the multiplier components usually vary within narrower bands, thus lying below the growth rate of overall GDP (dashed blue line), with the exception of the investment share (h), that tends to accompany the overall GDP growth rate.

Figure (2) **Growth rates of X, G, RES, DC, c, and h in the 1954-2020 period:** Solid line represents the quarterly growth rate of each demand component. Dashed line represents the quarterly growth of GDP



(a) g_X

(e) g_c

(b) g_G

(f) g_h

(c) g_{RES}

(g) g_μ

(d) g_{DC}

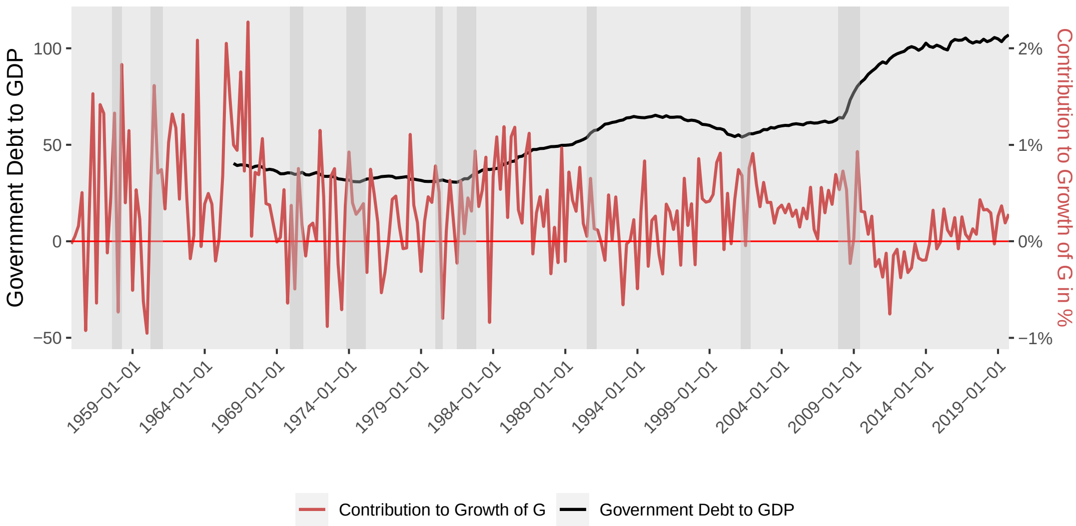
Source: Author's representation, BEA data.

Analysing the dashed blue line, one can compare the growth rate of each component with the growth rate of GDP. The components that grow faster than GDP are said to "pull up" the overall GDP growth rate depending on their share with respect to GDP. In this sense, the components with the highest shares (government expenditures G and exports X) are likely "pulling up" or downwards the GDP growth, as argued by (Zhu and Kotz, 2011, p.13).

> "If a component is growing faster than GDP, its growth can be thought of as "pulling up" the overall GDP growth rate, but if that component is a small share of GDP, then the "pull" would be very weak as would be shown by the low contribution share for that component. On the other hand, a component that is both growing and represents a large share of GDP will necessarily make a relatively large contribution to GDP growth, yet if it is growing more slowly than GDP, it would be "pulling down" the GDP growth rate."

Likewise, if the fastest growing component happens to be one with a smaller GDP share, the overall GDP growth rate might still grow less than that component, possibly implying acceleration in debt to income ratios (especially in the case of autonomous demand). Recently, Ligiero et al. (2021) come to similar conclusions through a simulation of the SSM using different parametrization to represent two types of countries (one in which government expenditures' share is relatively high, and the economy is more inward-oriented, and another in which government expenditures' share is relatively low, and the economy is more outward-oriented). The authors argue that the composition of autonomous demand, and thus, the one of output, has important effects on the economy's performance, level and rate of growth of GDP, and debt-to-GDP ratio. In fact, the authors find that in the country in which the government sector's share is relatively higher the self-defeating effect of austerity is much more dramatic (and vice-versa). The stylized facts shown in figure (3) provide an early support to this mechanism. In particular, in periods in which government expenditures contribute more to economic growth, the government debt-to-GDP ratio tends to stabilize; on the contrary, from the end of the 1970s until mid-1990s as well as after 2009, the debt ratio hikes, whereas the contribution of the government sector decreases.

Figure (3) **Government Debt to GDP Ratio vs. The Contribution to Growth of the Government Sector:** on the left-y-axis versus the quarterly contribution to growth in % of the government sector on the righ-y-axis

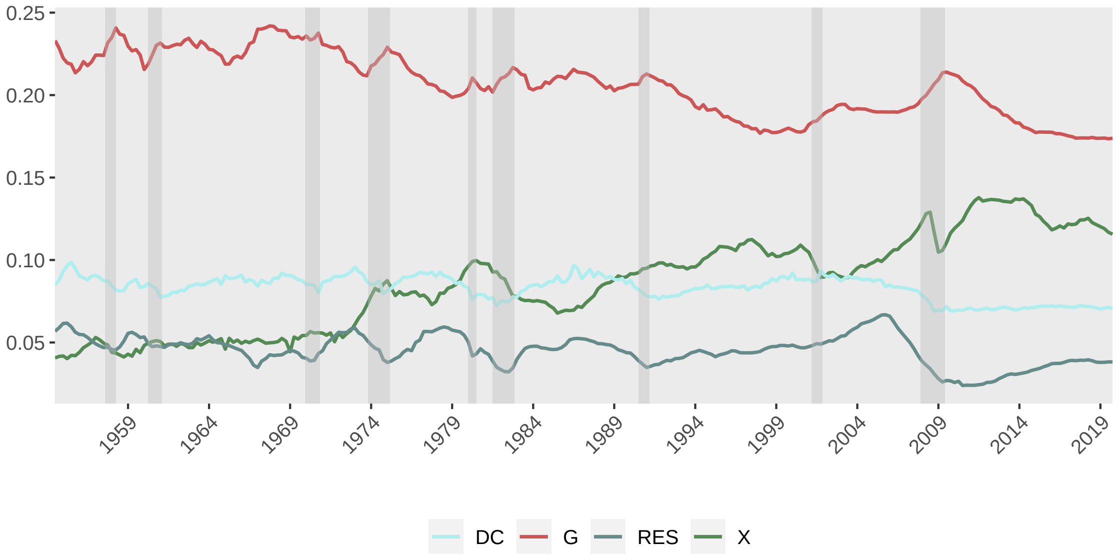


Source: Author's representation, BEA data.

Analysing figure (4), it is possible to realize that there has been a slow but definitely decreasing trend in government spending's share with respect to GDP (G), whereas there is a clear increase in the exports' share (X) from the first oil shock (1973) until recent periods.[6] In fact, in periods when the growth rate of G is higher than the overall GDP growth rate, the share of government expenditures increase, and vice-versa. The same rationality is valid for every other component. Durable consumption (DC) has maintained a very stable share with the exception of recession periods. Private residential investment (RES) has shown an increasing trend in the 2000s followed by a significant downturn during the crisis that has strike in that particular sector. In recent years residential investment has recovered a bit, probably supported by unconventional monetary policies and low interest rates.

[6]It is important to stress that despite showing a decreasing trend, government expenditures' share has punctually spiked in response to each recession (grey shaded areas), showing it's important counter cyclical behaviour in the US economy, compensating or partially compensating the negative shifts in all the other components.

Figure (4) **Each Component's Share with respect to GDP:** $\frac{X_{(0)}}{Y_{(0)}}$, $\frac{G_{(0)}}{Y_{(0)}}$, $\frac{RES_{(0)}}{Y_{(0)}}$, $\frac{DC_{(0)}}{Y_{(0)}}$



Source: Author's representation, BEA data.

Finally, the analysis of the calculations of the average quarterly contributions to growth in the US yields several interesting results. In table (3) the average quarterly growth decomposition considers both the whole time-frame (1954-2020) as well as the period excluding the great recession (1954-2007). Considering the whole time-frame, the US economy has experienced an average growth rate of about 0,77% (per quarter), excluding the post-crisis period the average growth is much higher (about 0.85%). In both periods the domestic sector (in particular related to the public sector represented by total government expenditures) has been the most important source of growth (0.63% between 1954-2020 and 0.73% between 1954-2007). The external sector had a much smaller contribution (about 0.12% between 1954-2020 and about 0.10% between 1954-2007). While the positive contribution of the external sector is explained by exports, the increase in the imported share of aggregate demand translated into a decrease in the domestic content (μ) of demand, which reduced, in turn, the contribution of the external sector as well the contribution of the supermultiplier (SM).

Table (3) **Average Quarterly Rate of Growth Decomposition:** US, 1954–2020 and 1954-2007 (constant 2010 prices)

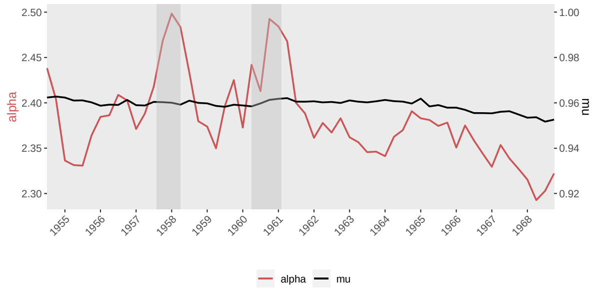
Variables	External Sector	Domestic Sector		E	Total	Z	SM	E
		Public	Private					
1954-2020								
μ	-0.08%				-0.08%		-0.08%	
X	0.20%				0.20%	0.20%		
G		0.32%			0.32%	0.32%		
RES			0.07%		0.07%	0.07%		
DC			0.14%		0.14%	0.14%		
C			0.07%		0.07%		0.07%	
I			0.03%		0.03%		0.03%	
E				0.01%	0.01%			0.01%
Total	0.12%	0.32%	0.31%	0.01%	0.77%	0.73%	0.02%	0.01%
1954-2007								
μ	-0.12%				-0.12%		-0.12%	
X	0.22%				0.22%	0.22%		
G		0.37%			0.37%	0.37%		
RES			0.08%		0.08%	0.08%		
DC			0.17%		0.17%	0.17%		
C			0.08%		0.08%		0.08%	
I			0.04%		0.04%		0.04%	
E				0.02%	0.02%			0.02%
Total	0.10%	0.37%	0.36%	0.02%	0.85%	0.85%	-0.01%	0.02%

Source: Author's calculation, BEA data.

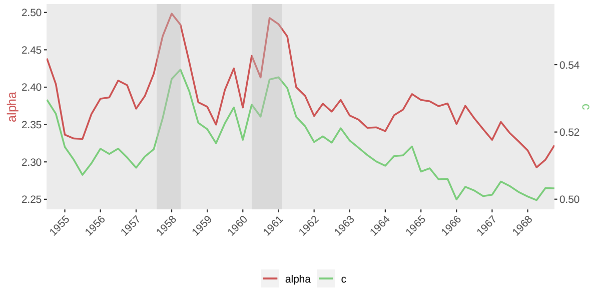
Since important differences in the analysis of growth contributions can already be observed by simply excluding the post-crisis period from the sample, it is worth taking a closer look into shorter periods of time, that could give a better picture of the engines of growth in each of these periods. Accordingly, the complete time-series will now be broken into five different sub-periods of 12-13 years each.

Analysing the evolution of the multiplier and of each of its components (figures 5, 6, 7, 8, and 9), it is possible to highlight a few patterns. First, in the period between 1954-1968, the variation of the multiplier (α) is almost completely explained by the movements in the propensity to consume (c), which has shown a significant fall from 1962-1968 (see figure 5c), while the investment share (h) has increased between 1958-1966 (see figure 5b) without preventing the fall in α. The domestic content of aggregate demand (μ) remains almost unchanged during the period (see figure 5a). It is interesting to notice that, the increase in the investment share is concomitant with the fall in the propensity to consume, restating an important implication of the SSM, which is that business investment to output ratio is positively correlated with autonomous demand.

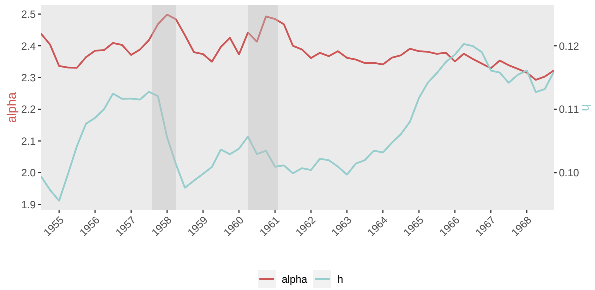
Figure (5) **The Multiplier:** The Evolution of μ, h, and C compared to α in the 1954-1968 period



(a) 1954-1968



(c) 1954-1968

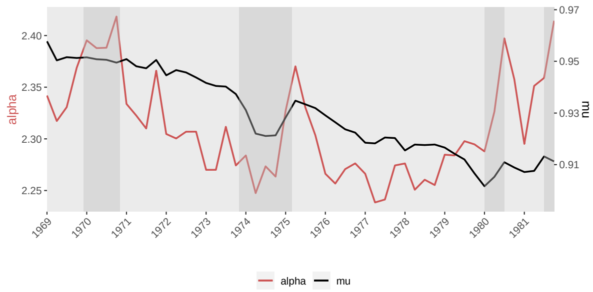


(b) 1954-1968

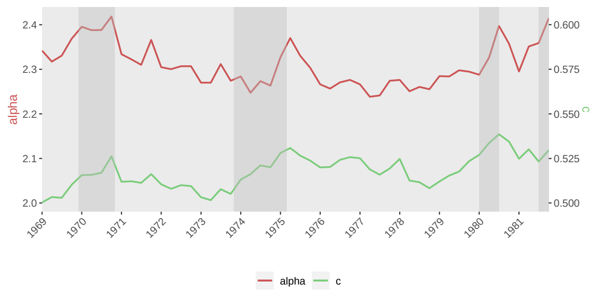
Source: Author's representation, BEA data.

In the second period analysed, the variations in the multiplier are mostly explained by a significant fall in μ (see figure 6a), which over compensates the increase in h from 1976-1981 (see figure 6b). The propensity to consume (c) varies very little (see figure 6c) presenting short lived peaks during recessions (grey shaded areas). This movements in c can be explained by the fact that the propensity to consume non-durable goods and services has an important share that is actually not compressible, so it tends to increase in periods of recession, when income decreases, and part of consumption remains unchanged.

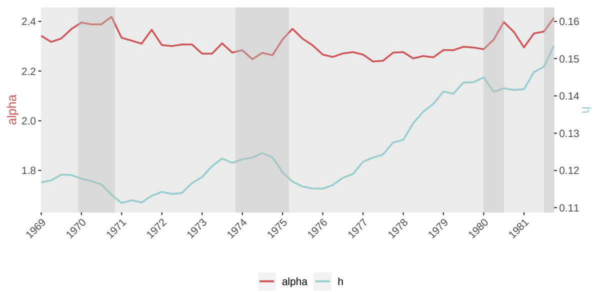
Figure (6) **The Multiplier:** The Evolution of μ, h, and C compared to α in the 1969-1981 period



(a) 1969-1981



(c) 1969-1981

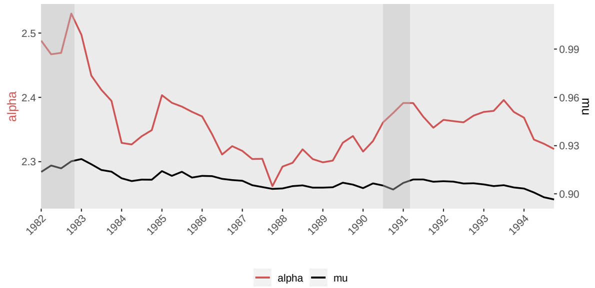


(b) 1969-1981

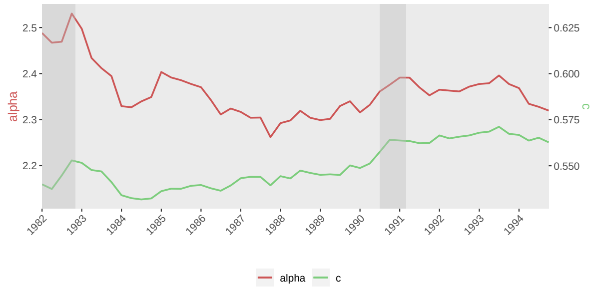
Source: Author's representation, BEA data.

In the third period (between 1982-1994), the variations in the multiplier can be mostly explained by a fall in the investment share (h), in particular from 1984-1992 (see figure 7b), which have been partially compensated by an opposite movement in c (see figure 7c). The domestic content of aggregate demand remained almost unchanged with a slight decrease from 1983-1985 and in 1994 (see figure 7a).

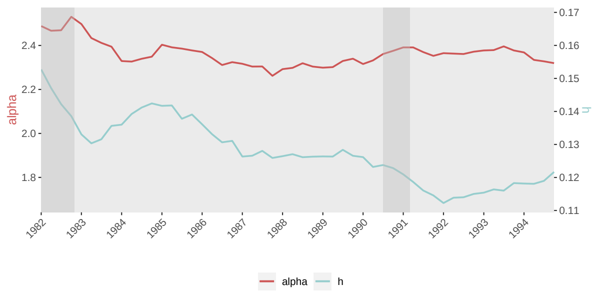
Figure (7) **The Multiplier:** The Evolution of μ, h, and C compared to α in the 1982-1994 period



(a) 1982-1994



(c) 1982-1994

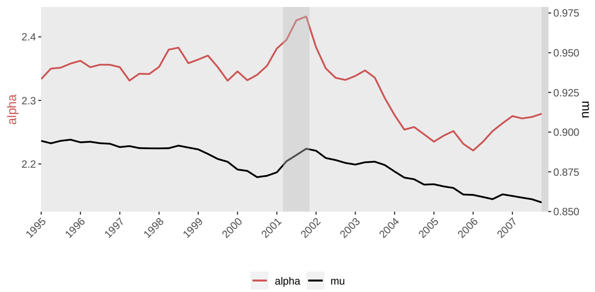


(b) 1982-1994

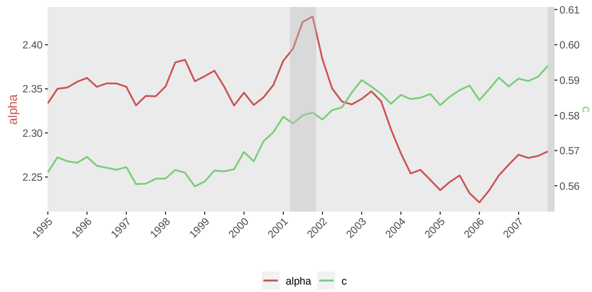
Source: Author's representation, BEA data.

In the fourth period (between 1995-2007) the domestic content of aggregate demand has decreased significantly with the only exception being the period of the dot-com crisis between 2000-2002 (see figure 8a). The fall in μ has been over compensated by an increase in the investment share (h) between 1995-2000 (see figure 8b) and by an unprecedented increase in the propensity to consume (c) between 1999-2003 (see figure 8c). Nevertheless, after the dot-com crisis the multiplier (α) kept decreasing reaching its all-time low in 2006 (about 2.2), which can be explained by the fact that the domestic content of aggregate demand kept decreasing whereas c remained almost unchanged and h did not return to its pre-crisis level until the outbreak of the Great Financial Crisis.

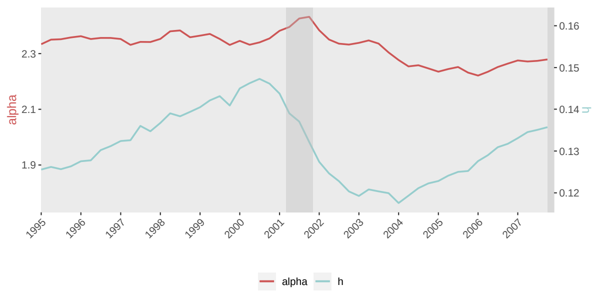
Figure (8) **The Multiplier:** The Evolution of μ, h, and C compared to α in the 1995-2007 period



(a) 1995-2007



(c) 1995-2007

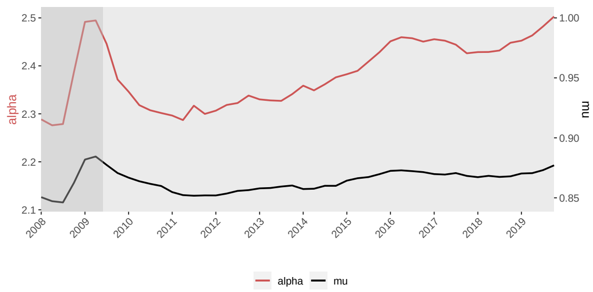


(b) 1995-2007

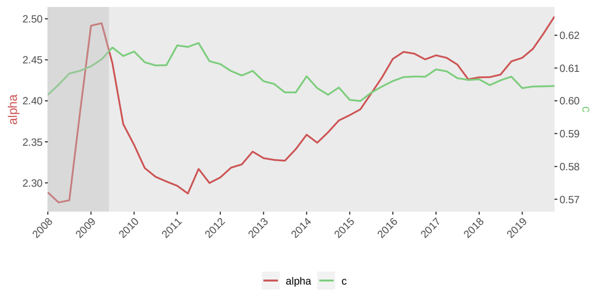
Source: Author's representation, BEA data.

In the fifth and last period analysed (between 2008-2020) the recovery of the multiplier is mostly explained during the recession by the domestic content of demand (μ) and by the propensity to consume. After the great recession, however, μ falls until 2012 to begin peaking up again, what explains most of the recover of α (see figure 9a). The investment share (h) also contributes to the recovery of the multiplier, even if to a lesser degree, being able to roughly return to its pre-2007 level by 2020.

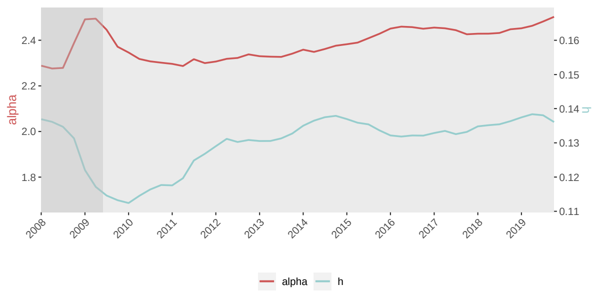
Figure (9) **The Multiplier:** The Evolution of μ, h, and C compared to α in the 2008-2020 period



(a) 2008-2020



(c) 2008-2020



(b) 2008-2020

Source: Author's representation, BEA data.

Analysing the growth rates of the different components of demand compared to the overall GDP growth rate (figures 10, 11, 12, 13, and 14) it is possible to have an idea of which component is "pulling up" or down the overall growth rate.

In the period between 1954-1968, it is possible to highlight that the overall growth rate is "pulled up" by exports, in particular between 1955-1957, 1959-1960, 1963-1965 (see figure 10a). In the period of recession (between 1957-1958 and 1960-1961) the overall growth rate is "pulled up" by the growth rate in the propensity to consume, which otherwise "pulls down" the overall result (see figure 10e), and by government expenditures (see figure 10b). The latter also leads the overall growth rate between 1965-1967. In fact, these findings match the movements in the investment share, which tends to go up when exports and government expenditures increase.

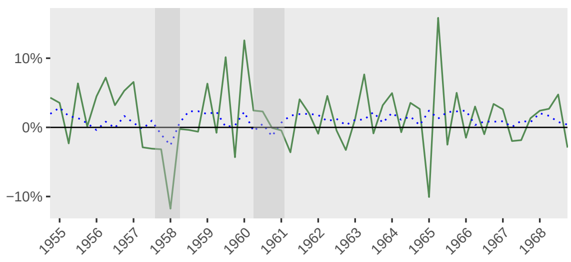
In the second period (between 1969-1981) two important patterns can be highlighted. First, the overall growth rate is mostly explained by exports dynamics (see figure 11a), which is less evident between the two oil shocks (1973-1979). Second, the growth rate of government expenditure seems to be loosing strength "pulling up" the overall result only in the periods of recession (see figure 11b).

In the third period (between 1982-1994) two movements that can be highlighted. In the first half of the period (between 1982-1987), the growth rate of GDP is mostly "pulled up" by private residential investments (RES) and durable consumption goods (DC) growth rates (see figures 12c and 12d). In the other half (1988-1994), the growth rate of exports leads the overall result (see figure 12a) and private residential investment and durable goods' consumption lose importance.

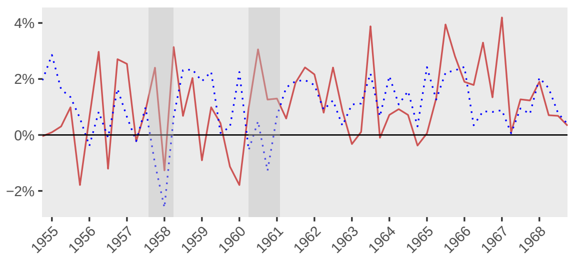
In the fourth period analysed (between 1995-2007) we ought to split the analysis once more into two sub-periods. In the first period before the dot-com bubble (2001), exports, private residential investment, and durable goods' consumption share the lead of overall GDP growth (see figures 13a, 13c, and 13d). After the recession followed by the burst of the dot-com bubble, private residential investment and exports alone lead the growth of GDP until the significant deceleration in RES, which started in 2006 and culminated in the Great Financial Crisis.

Finally, in the last period (between 2008-2020), it is interesting to see how the growth rate in government expenditures "pull down" the overall GDP growth rate, in particular from 2009-2015 (see figure 14b). Between 2009-2012 the growth rate of exports "pulls up" the overall result (see figure 14a), whereas between 2011-2016 private residential investment "pulls up" GDP (see figure 14c). After 2016, exports alone leads GDP.

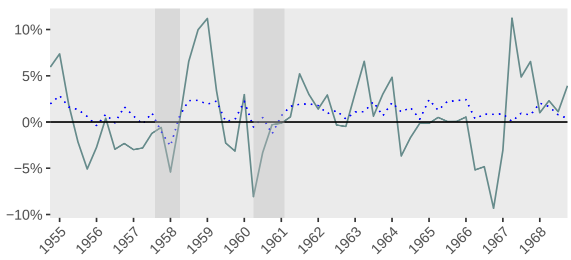
Figure (10) **Growth rates of X, G, RES, DC, c, and h in the 1954-1968 period:** Solid line represents the quarterly growth rate of each demand component. Dashed line represents the quarterly growth of GDP



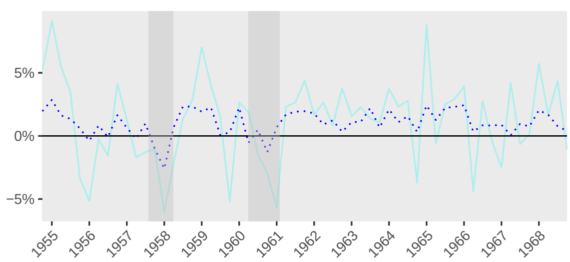
(a) g_X 1954-1968



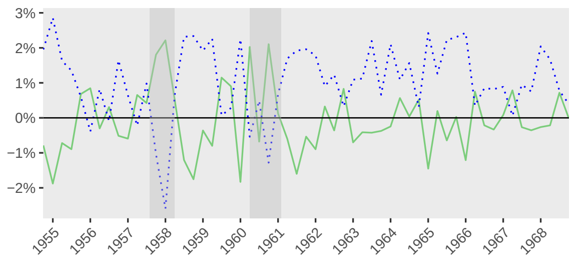
(b) g_G 1954-1968



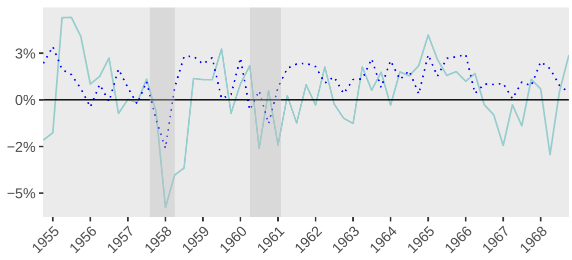
(c) g_{RES} 1954-1968



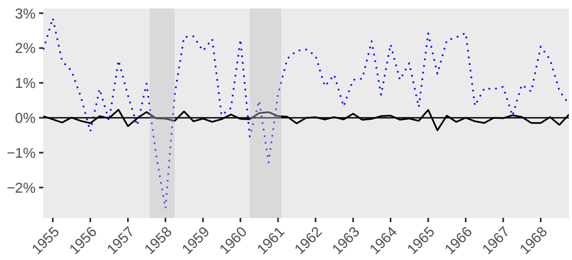
(d) g_{DC} 1954-1968



(e) g_c 1954-1968



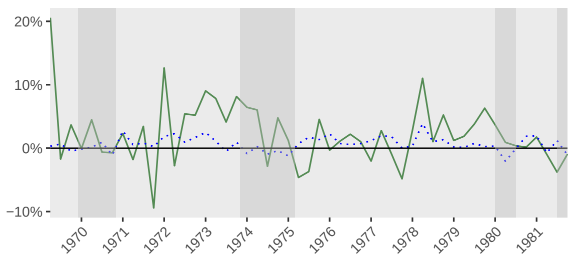
(f) g_h 1954-1968



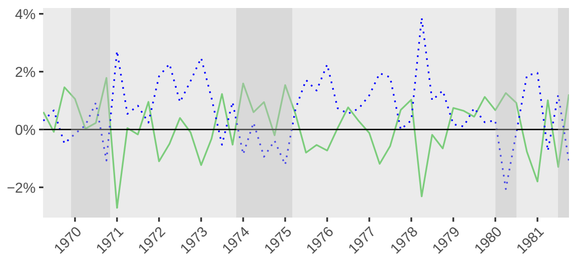
(g) g_μ 1954-1968

Source: Author's representation, BEA data.

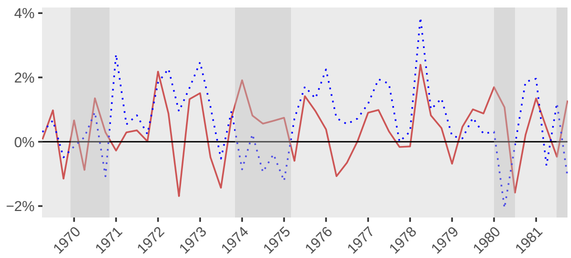
Figure (11) **Growth rates of X, G, RES, DC, c, and h in the 1969-1981 period:** Solid line represents the quarterly growth rate of each demand component. Dashed line represents the quarterly growth of GDP



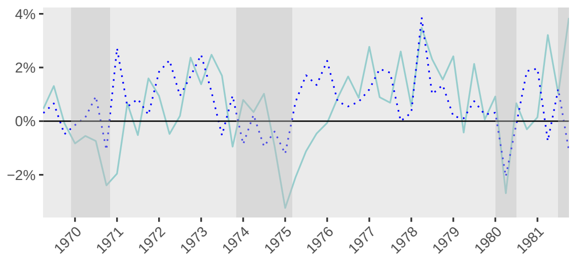
(a) g_X 1969-1981



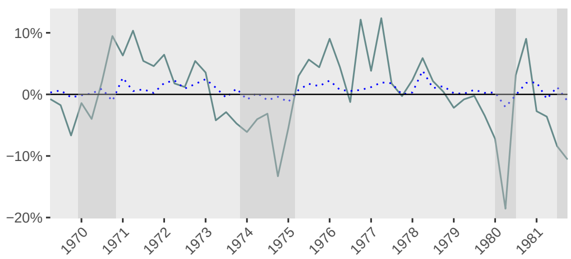
(e) g_c 1969-1981



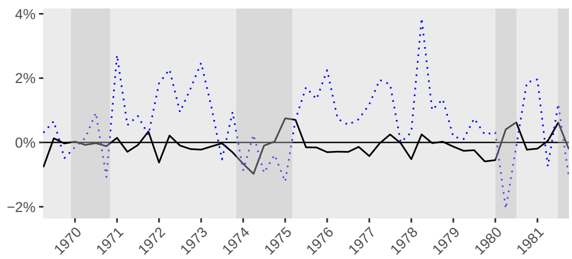
(b) g_G 1969-1981



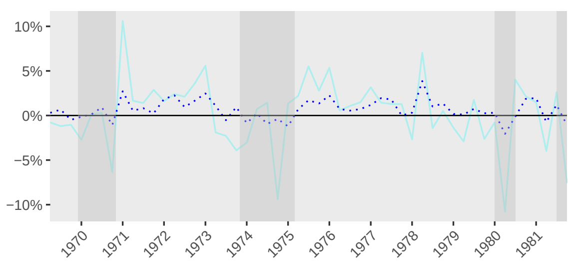
(f) g_h 1969-1981



(c) g_{RES} 1969-1981



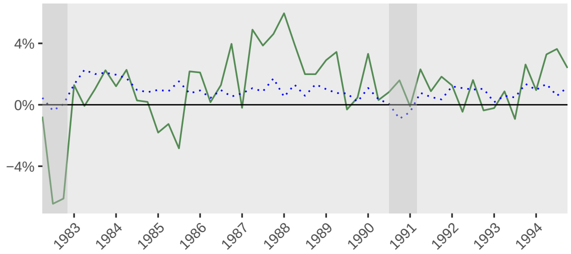
(g) g_μ 1969-1981



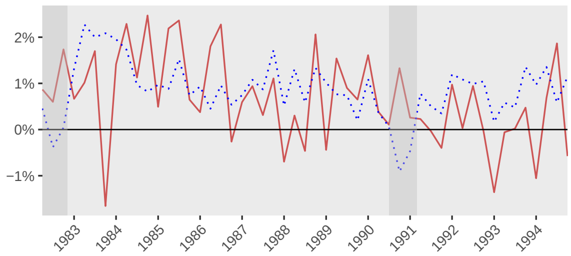
(d) g_{DC} 1969-1981

Source: Author's representation, BEA data.

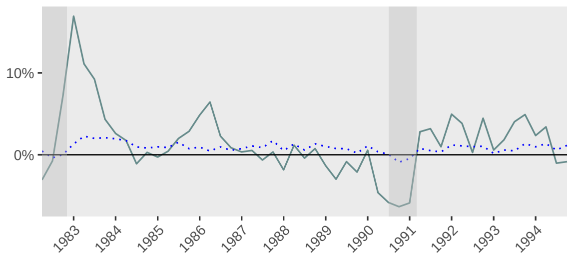
Figure (12) **Growth rates of X, G, RES, DC, c, and h in the 1982-1994 period:** Solid line represents the quarterly growth rate of each demand component. Dashed line represents the quarterly growth of GDP



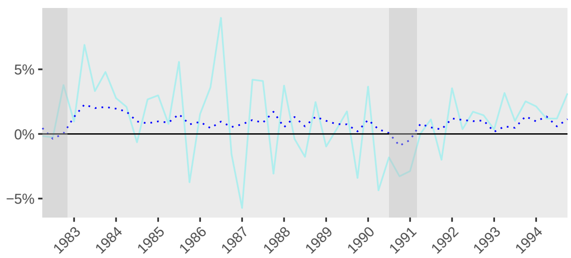
(a) g_X 1982-1994



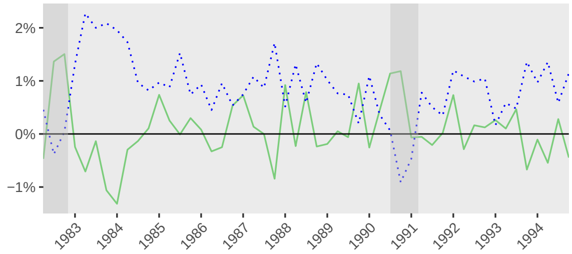
(b) g_G 1982-1994



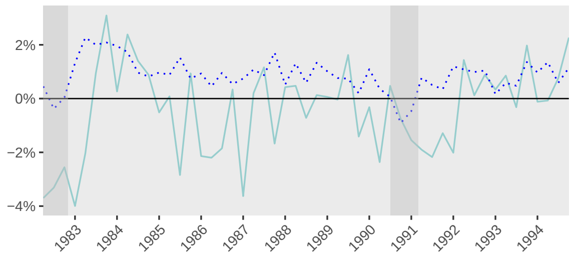
(c) g_{RES} 1982-1994



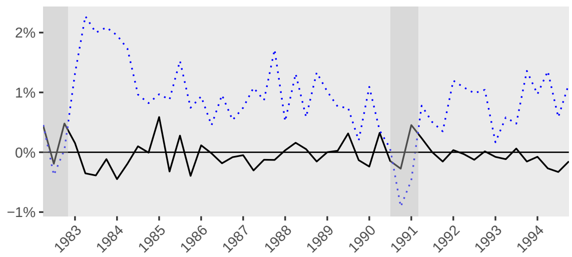
(d) g_{DC} 1982-1994



(e) g_c 1982-1994



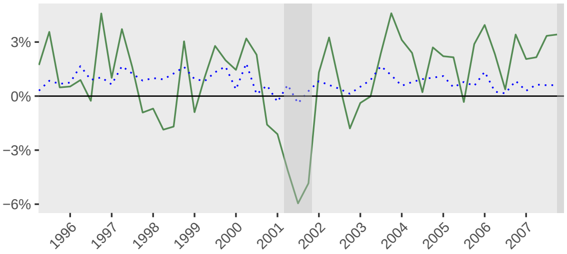
(f) g_h 1982-1994



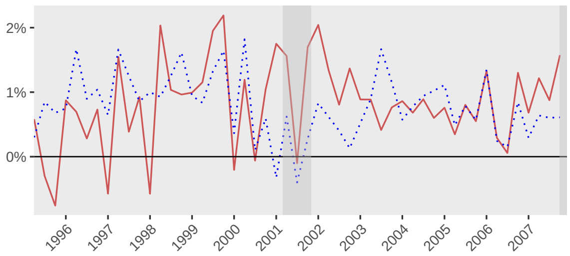
(g) g_μ 1982-1994

Source: Author's representation, BEA data.

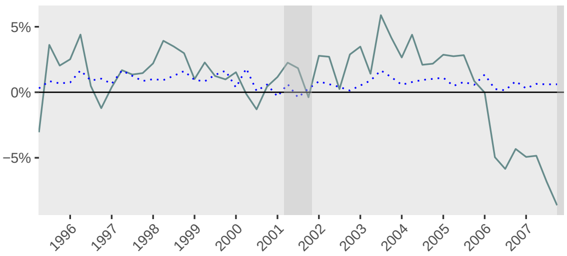
Figure (13) **Growth rates of X, G, RES, DC, c, and h in the 1995-2007 period:** Solid line represents the quarterly growth rate of each demand component. Dashed line represents the quarterly growth of GDP



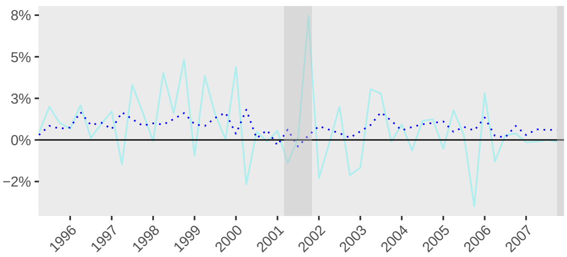
(a) g_X 1995-2007



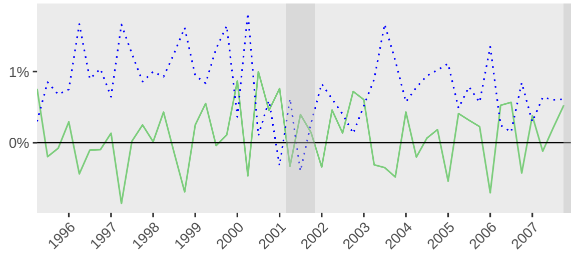
(b) g_G 1995-2007



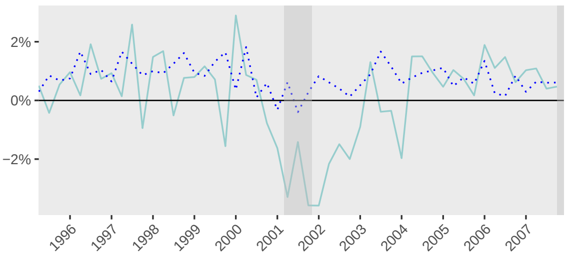
(c) g_{RES} 1995-2007



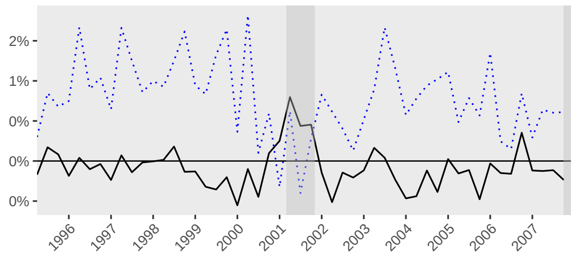
(d) g_{DC} 1995-2007



(e) g_c 1995-2007



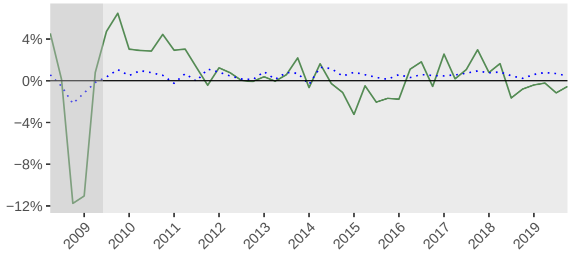
(f) g_h 1995-2007



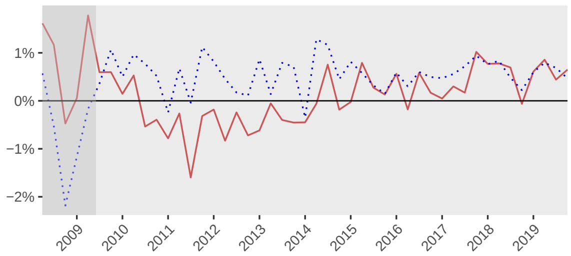
(g) g_μ 1995-2007

Source: Author's representation, BEA data.

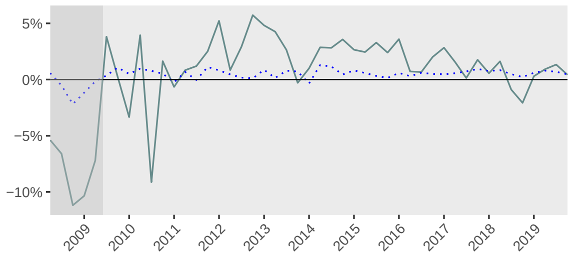
Figure (14) **Growth rates of X, G, RES, DC, c, and h in the 2008-2020 period:** Solid line represents the quarterly growth rate of each demand component. Dashed line represents the quarterly growth of GDP



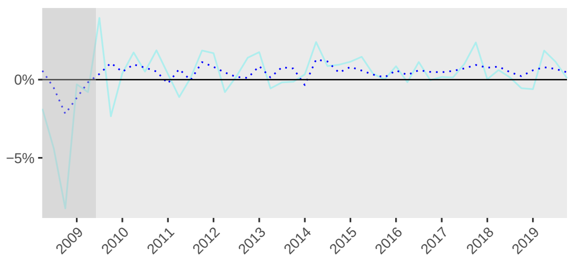
(a) g_X 2008-2020



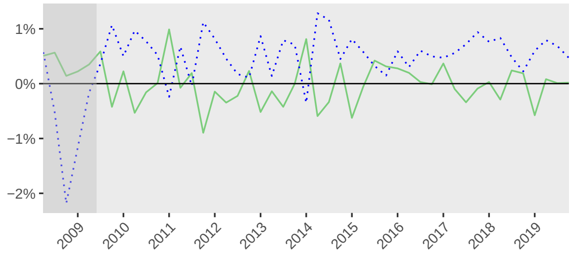
(b) g_G 2008-2020



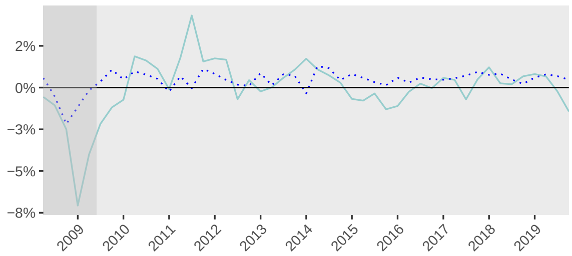
(c) g_{RES} 2008-2020



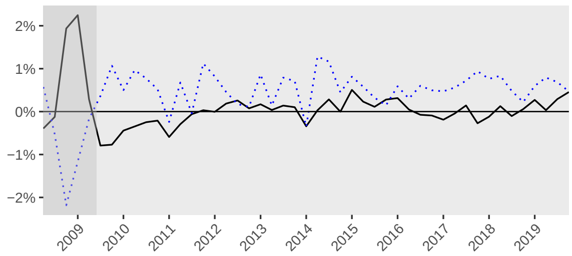
(d) g_{DC} 2008-2020



(e) g_c 2008-2020



(f) g_h 2008-2020

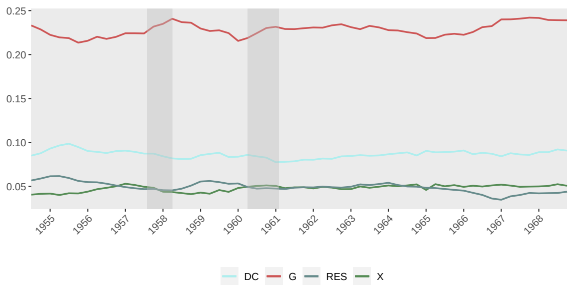


(g) g_μ 2008-2020

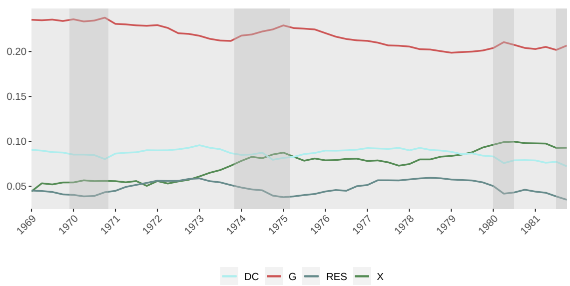
Source: Author's representation, BEA data.

Analysing the changes in the components' share, it is possible to highlight a few patterns that confirm that components that grow faster than GDP gain share, whereas the ones that grow less than GDP lose their share. In fact, whereas in the period between 1954-1968 export and government expenditure lead the overall growth rate, both components maintained their respective shares almost constant (see figure 15a). On the contrary, when government expenditures' growth rate lost strength, the share of G decreased (see figure 15c), whereas the one of exports peaks up and surpasses durable goods' consumption for the first time. In the subsequent period (between 1982-1994) this trend is confirmed, with exports gaining share in particular after 1987 (see figure 15b). In the period that encompasses the burst of the dot-com bubble and the great moderation it is possible to see the rise and fall of private residential investment (that almost surpasses durable goods' consumption) and the exceptional acceleration of exports that reaches its all-time high since 1954 before the burst of the housing bubble (see figure 15d). Finally, in the period between 2008-2020 exports' share is consolidated in the second place, decreasing its distance from government expenditures' share (which lost participation after the great recession) – figure (15e).

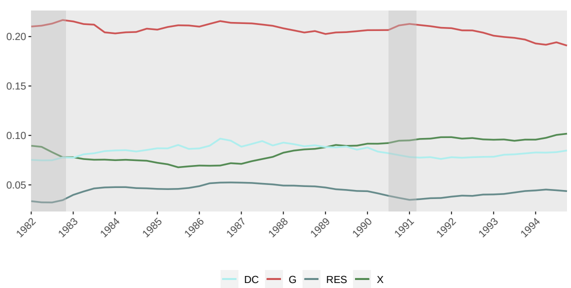
Figure (15) **Each Component's Share with respect to GDP:** $\frac{X_{(0)}}{Y_{(0)}}, \frac{G_{(0)}}{Y_{(0)}}, \frac{RES_{(0)}}{Y_{(0)}}, \frac{DC_{(0)}}{Y_{(0)}}$



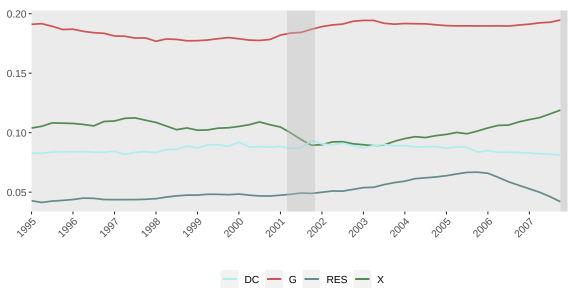
(a) 1954-1968



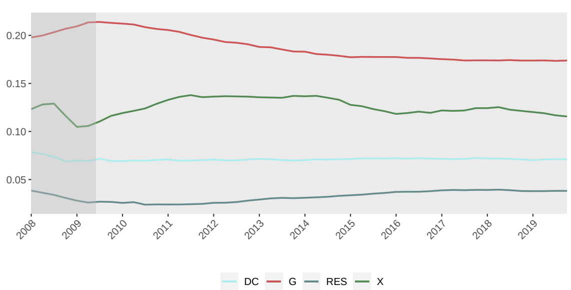
(c) 1969-1981



(b) 1982-1994



(d) 1995-2007



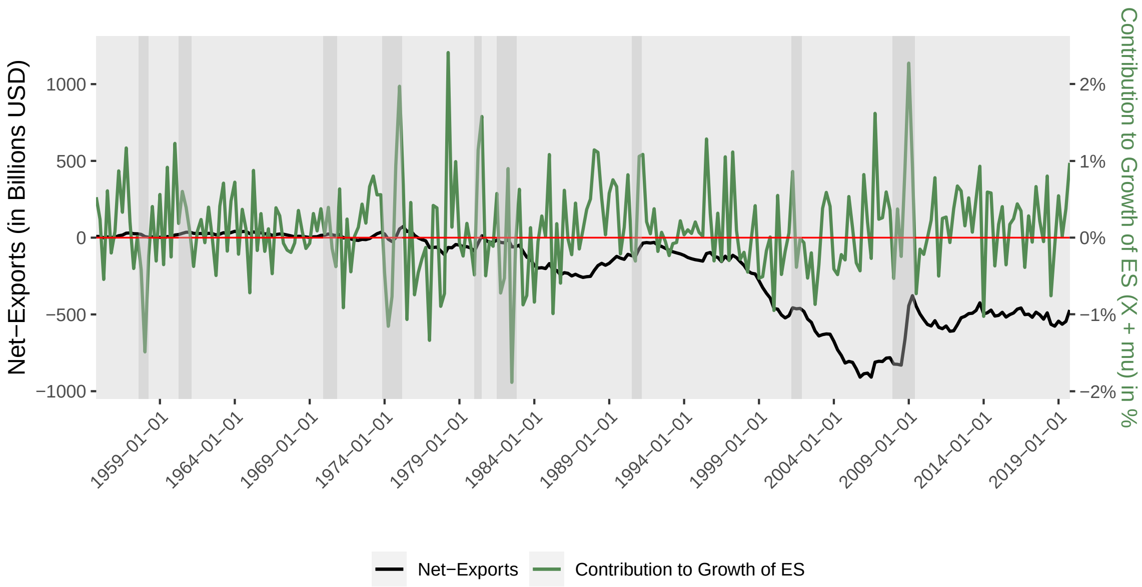
(e) 2008-2020

Source: Author's representation, BEA data.

Analysing the results in table (4), it is clear that in all the periods analysed autonomous expenditures significantly outperformed the supermultiplier in explaining growth with the only exception of the recent post-crisis period, where autonomous expenditures contributed with about 0.21 p.p. closely followed by the supermultiplier (about 0.18 p.p.). Analysing both the supermultiplier and the components of autonomous demand, it follows that: i. the domestic components of demand (μ) contributed significantly to the increase in the supermultiplier; ii. private residential investment (RES) and durable goods' consumption (DC) presented an almost null contribution to autonomous demand and, thus, to total output growth.[7]

As regards the contribution of the external sector, one should notice that it remains positive and rather stable in the first three periods analysed (1954-1968; 1969-1981; 1982-1994), impacting the total growth rate of GDP positively with about 0.10 p.p. on average per quarter. Due to the significant increase in imports experienced in the US, the contribution of the external sector has indeed decreased in the period between 1994-2007, explained in particular by the decrease in the domestic content of aggregate demand. However, the increase in exports overcompensates the negative weight of the decrease in the domestic content of aggregate demand. In fact, this proves that even in periods in which net-exports are negative, the contribution of the external sector can still be positive (see figure 16).[8]

Figure (16) **Net-Exports vs. The Contribution to Growth of the External Sector:** Net-exports in billions of USD on the left-y-axis versus the quarterly contribution to growth in % of the external sector on the righ-y-axis



Source: Author's representation, BEA data.

Analysing the results in period-by-period fashion, it is clear that the US economy experienced

[7]For a complete picture of each of the periods analysed, the interested reader should refer to Appendix (B), where a detailed quarterly growth decomposition by component compared to the overall GDP quarterly growth rate can be found. The results presented in table (4) are an average of the detailed results presented in the Appendix.

[8]Of course, these results should be interpreted with care. In fact, the US economy does not have a binding balance of payment constraint, given the position of the USD in the currency hierarchy (De Paula et al., 2017; Fritz et al., 2018). On the contrary, developing economies cannot run current account deficits in the long run.

significantly higher growth rates between 1954-1968 (on average 1.04% / per quarter).[9] In fact, the quarter century following the post-World War II was a period of unprecedented prosperity and expansion not only for the US, as well as (and even more so) in other advanced capitalist economies (European countries and Japan). During those years the world economy experienced unprecedented growth rates that were accompanied by increases in labor productivity and ***pari passu*** increase in real wages, acceleration in the growth rate of the capital stock, and by a structural sectoral shift of the labor force from agriculture towards industry and services (Glyn et al., 1988). The significant contribution of the domestic public sector (G), which contributed with 0.59 p.p. quarterly growth rate on average during the period, can be explained by the Kennedy-Johnson (the eras of *the New Frontier* and *the Great Society*) fiscal expansion, which was mainly associated with social programs that have been implemented (especially during the the years in which Johnson was in office) and the military spending of Vietnam War (which also caused civil disorders due to the opposition to the war).

The subsequent period (between 1969-1981) shows a much lower growth rate (0.70% overall quarterly growth rate on average).[10] The deceleration in the overall growth rate can be explained by a significant decrease in the contribution of the public domestic sector, which is surpassed by the private domestic sector. In fact, those years can be characterized by the *erosion of the Golden Age*.[11] The apparatus created in the Golden Age started to be dismantled, and, in fact, as argued by Steindl (1976), differently than in the years followed by the roaring twenties, this stagnation period was not caused by the exuberance of finance, but by policy. The argument developed in the Post-Script written in June of 1976 published in the 2nd edition of his *Maturity and Stagnation in American Capitalism* is clear: "we witness stagnation not as an incomprehensible fate, as in the 1930s, but stagnation as policy" (Steindl 1976, p.).

In the following period (between 1982-1994) the average quarterly growth rate presents a slight improvement compared to the previous period. [12] In fact, the contribution of the external sector slightly improves (especially due to a lesser negative contribution of the domestic content of aggregate demand), and the domestic public sector picks up. However, as highlights by Minsky (1993), the government expenditures of the Reagan era were mostly financing a budget that was mainly devoted to military spending and to supporting consumption, which, indeed failed to boost investment, that presented mostly negative growth rates in those years. In the years of the Clinton administration, fiscal policy was conducted raising taxes on higher income taxpayers and reducing defense and welfare spending (1993-2001).

In the years that followed (between 1995-2007), two major booms have been experienced in the US economy.[13] The first was the dot-com boom, which came to a sudden halt after the burst of the bubble which was being fed by excessive speculation of internet-related companies. The second was the housing boom. In retrospect, it is clear that the inflated bubbles of the early and mid-2000s were intrinsically connected to a long trend of steady increase in consumer debt, which was accompanied by a combination of factors that have been intensified by a series of financial innovations.[14] This

[9]The period encompasses the mandates of Eisenhower, Kennedy, and Johnson in the White House.

[10]This period encompasses Nixon's, Ford's, and Carter's administration.

[11]For a discussions on whether the Golden Age patterns of development were undermined by its own internal tensions or alternatively by exogenous factors such as the OPEC shock the interested reader can refer to Glyn et al. (1988).

[12]The timespan corresponds to the mandates of Reagan and Bush Sr..

[13]This period encompasses the presidency of Clinton and Bush Jr..

[14]The emergence of financial innovations in the US have been legitimized by the approval of the Gramm–Leach–Bliley Act, also known as the Financial Services Modernization Act of 1999. The Gramm–Leach–Bliley Act dismantled part

constellation has both allowed American households to withdraw equity from their homes, as well as it fed an unprecedented housing boom (Guttmann and Plihon, 2010). In fact, private residential investment, durable consumption goods, and consumption drive part of the growth until 2006 and slightly accelerate investment (which barely managed to recover from the historical low after the dive between 2000-2003).[15] The public domestic sector presented a slightly higher contribution compared to the previous period, which can be explained

Finally, the period with the lowest growth corresponds to the post-crisis period, in line with the concern about stagnant growth (in particular in advanced economies) emphasized by a wide-range of researchers discussing the phenomenon of secular stagnation. It is clear from the decomposition of the average growth rates that most of the decrease in total growth rates can be explained by the reduction of the contribution of the public sector. In this sense, the argument developed by Steindl (1976) on stagnation policies seems to be even more appropriate to explain the growth pattern of the recent period in the US economy. Steindl's argument is in fact picked up by Hein (2016), who has restated the importance of economic policies to target long-run growth, and stagnation, in particular fiscal policies. Moreover, in this last period analysed, the external sector lead growth in the US economy, contributing to a growth rate of 0.23 p.p. on average per quarter and followed by the domestic sector (about 0.16% on average). This latter result should be taken with care, given the shrinkage of the domestic sector in the country, which is unprecedented compared to the previous years. In this sense, not only the public sector is to blame, but also the private one. This remains as a topic to be further investigated, given that the stagnant growth experienced by the US economy has been accompanied by increasing wealth and income inequalities that no longer are being compensated by debt-financed consumption (as in the Great Moderation period). These results are in line with Cynamon and Fazzari (2017) that emphasized the weakness of household demand followed by the increasing trend in consumption that culminated in the Great Financial Crisis. The authors also point to the stagnation in government spending after 2010 and to trade improvements, that partially compensated the weak domestic demand results.

of the Glass-Steagall Act of 1933, which was contructed to prevent turmoils related to financial and banking sectors after the Great Depression followed by the 1929 Wall Street Crash. As it happened both in the aftermath of the 1930s (Glass-Steagall Act) and the 2007-08 (Dodd-Frank Act) crises, banks face "reregulation" closing the dialectic circle of regulation and innovation in the banking sector. For an in-depth analysis on how banks try to bypass/evade regulations by means of innovations, and having succeeded to escape those regulatory restraints, enjoy their newly found freedom to the point of excess behaviour as a result of which they trigger financial crises see Guttmann (2016).

[15] See figure (20) in Appendix (B) for a quarterly decomposition of the growth rate.

Table (4) **Average Quarterly Rate of Growth Decomposition:** US, 1954–1968; 1969-1981; 1982-1994; 1995-2007; 2008-2020 (constant 2010 prices)

Variables	**External Sector**	**Domestic Sector**		**E**	**Total**	**Z**	**SM**	**E**
		Public	**Private**					
				1954-1968				
μ	-0.04%				-0.04%		-0.04%	
X	0.16%				0.16%	0.16%		
G		0.59%			0.59%	0.59%		
RES			0.07%		0.07%	0.07%		
DC			0.23%		0.23%	0.23%		
C			-0.10%		-0.10%		-0.10%	
I			0.07%		0.07%		0.07%	
E				0.07%	0.07%			0.07%
Total	0.12%	0.59%	0.27%	0.07%	1.04%	1.05%	-0.08%	0.07%
				1969-1981				
μ	-0.19%				-0.19%		-0.19%	
X	0.29%				0.29%	0.29%		
G		0.20%			0.20%	0.20%		
RES			0.04%		0.04%	0.04%		
DC			0.06%		0.06%	0.06%		
C			0.12%		0.12%		0.12%	
I			0.16%		0.16%		0.16%	
E				0.01%	0.01%			0.01%
Total	0.10%	0.20%	0.39%	0.01%	0.70%	0.59%	0.10%	0.01%
				1982-1994				
μ	-0.07%				-0.07%		-0.07%	
X	0.19%				0.19%	0.19%		
G		0.32%			0.32%	0.32%		
RES			0.13%		0.13%	0.13%		
DC			0.22%		0.22%	0.22%		
C			0.16%		0.16%		0.16%	
I			-0.15%		-0.15%		-0.15%	
E				0.02%	0.02%			0.02%
Total	0.12%	0.32%	0.36%	0.02%	0.82%	0.87%	-0.06%	0.02%
				1995-2007				
μ	-0.20%				-0.20%		-0.20%	
X	0.26%				0.26%	0.26%		
G		0.36%			0.36%	0.36%		
RES			0.09%		0.09%	0.09%		
DC			0.14%		0.14%	0.14%		
C			0.14%		0.14%		0.14%	
I			0.06%		0.06%		0.06%	
E				-0.03%	-0.03%			-0.03%
Total	0.05%	0.36%	0.43%	-0.03%	0.81%	0.85%	0.00%	-0.03%
				2008-2020				
μ	0.13%				0.13%		0.13%	
X	0.10%				0.10%	0.10%		
G		0.08%			0.08%	0.08%		
RES			0.01%		0.01%	0.01%		
DC			0.02%		0.02%	0.02%		
C			0.05%		0.05%		0.05%	
I			0.00%		0.00%		0.00%	
E				0.00%	0.00%			0.00%
Total	0.23%	0.08%	0.08%	0.00%	0.39%	0.21%	0.18%	0.00%

Source: Author's calculation, BEA data.

4 Concluding remarks

Following the methodology of Freitas and Dweck (2013), this paper has shown that the contributions to growth of each component of aggregate demand are given by their respective shares with respect to GDP at time (0), times the growth rate of that same component verified at time (1), times the multiplier at time (1). In particular, by carefully analysing the components of the multiplier, this contribution has shed light on the reasons for having different multipliers for different demand components. In this sense, it has been argued that the multiplier of each demand component is related to: i. the share of imports required by each demand component; ii. the income distribution engendered by the underlying income generating process triggered by each demand component; iii. by the adjustment in the investment share engendered by each demand component (some components might engender a bigger crowd-in effect).

The careful allocation of imports in the calculation of the contributions to growth and the analysis of growth patterns in the US allow to draw three concluding remarks. First, the very low growth rates experienced in the recent period (2008-2020) were mainly explained by a very small contribution of the government sector, making the case of 'stagnation policies' (Steindl, 1976), and restating the importance of public policies oriented to boost economic growth in the long run and offset stagnation tendencies (Hein, 2016). Second, the empirical results could confirm that the external sector can have a positive contribution to growth even in a context of negative net-exports if the contribution of exports is sufficient to compensate the a possible negative contribution of the domestic content of aggregate demand (as in the period between 1994-2007). Third, in the most recent period (2008-2020), due to an increase in the domestic content of aggregate demand accompanied by a shrinkage of the private domestic sector, the external sector takes the lead. This latter result could be explained not only by the good performance in exports and reduction in imports, but also by the very low contribution of the public sector highlighted in the first point and by a stagnation in the private sector. In fact, the private domestic sector seems to be contributing very little to the overall growth rate, reaching an unprecedentedly low contribution.

A Data Sources

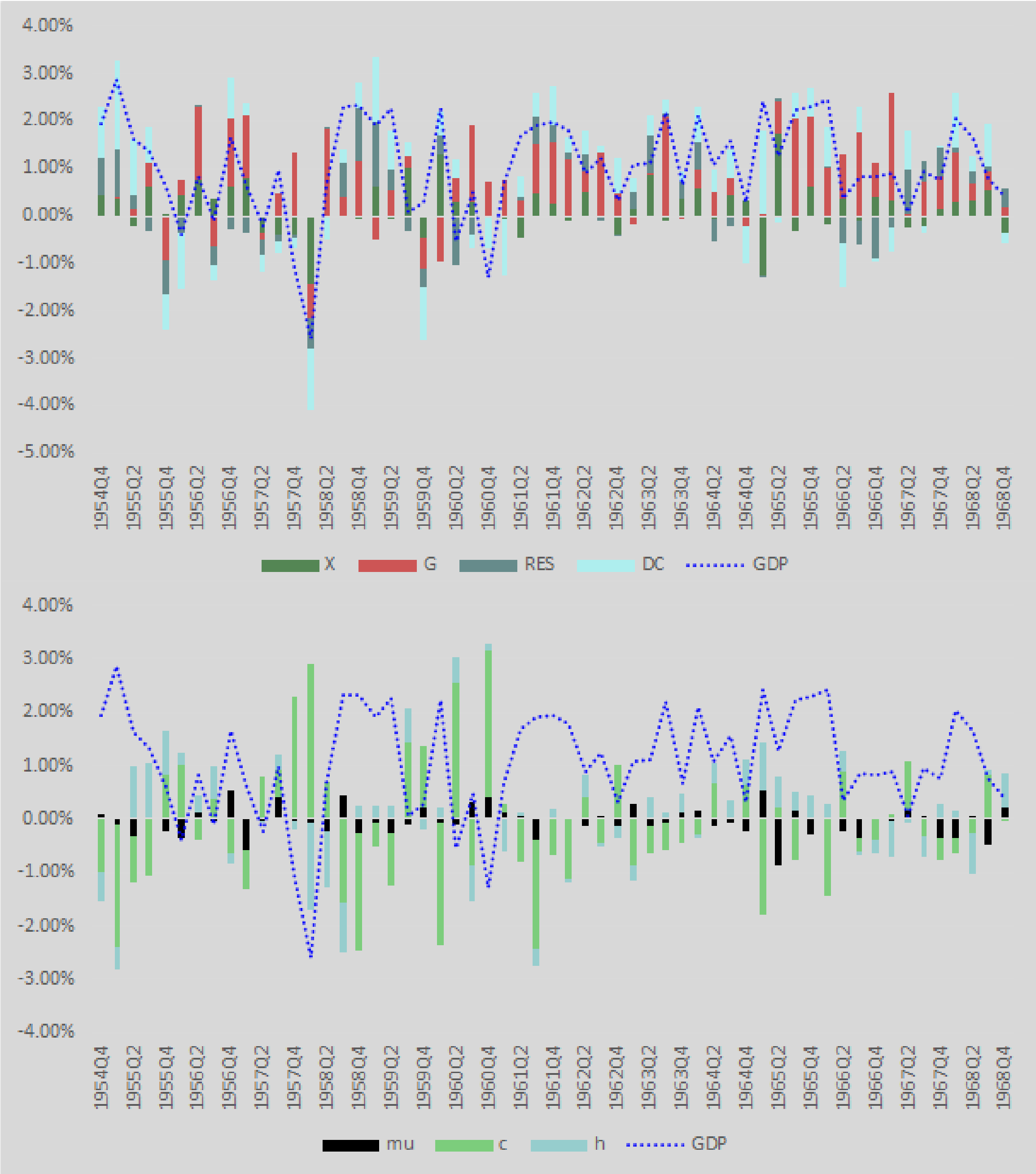
Data Sources Chapters 2, 3, and 4

- FF: Effective Federal Funds Rate, Quarterly Data, Federal Reserve Economic Data, Federal Reserve Bank of St. Louis. Available at: https://bit.ly/2VbSDcv
- X: Exports of goods and services in Billions of Dollars, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.5. Available at: https://bit.ly/34Dl0sj
  Deflated using the Implicit Price Deflator for Exports of goods and services, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.9. Available at: https://bit.ly/2z6230N
- G: Government consumption expenditures and gross investment in Billions of Dollars, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.5. Available at: https://bit.ly/34Dl0sj
  Deflated using the Implicit Price Deflator for Government consumption expenditures and gross investment, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.9. Available at: https://bit.ly/2z6230N
- CA: Autonomous Consumption (the sum of Private Residential Investment and Consumer Credit)
  - Res: Gross Private Residential Domestic Investment in Billions of Dollars, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.5. Available at: https://bit.ly/34Dl0sj
    Deflated using the Implicit Price Deflator for Gross Private Residential Domestic Investment, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.9. Available at: https://bit.ly/2z6230N
  - CC: Flow of Total Consumer Credit Owned and Securitized in Billions of Dollars, Seasonally Adjusted, Quarterly Data, Federal Reserve Economic Data, Federal Reserve Bank of St. Louis. Available at: https://bit.ly/31xxNHw
    Deflated using the Implicit Price Deflator for Personal Consumption Expenditures, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.9. Available at: https://bit.ly/2z6230N
- GDP: Gross Domestic Product in Billions of Dollars, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.5; Available at: https://bit.ly/34Dl0sj
  Deflated using the Implicit Price Deflator for Gross Domestic Product, Seasonally Adjusted, Quarterly Data, Bureau of Economic Analysis, NIPA Table 1.1.9.; Available at: https://bit.ly/2z6230N
- HP: Nominal house price index covering the sales of newly-built and existing dwellings, Quarterly Data, OECD, Housing prices (indicator); Available at: https://bit.ly/3ybk3Re
- RENT: Housing rent price index, Quarterly Data, OECD, Inflation (CPI); Available at:https://bit.ly/3hu92ox
- CPI:Consumer Price Index, Quarterly Data, OECD, Housing prices (indicator); Available at:https://bit.ly/3uLlALW

B Quarterly Growth Decomposition

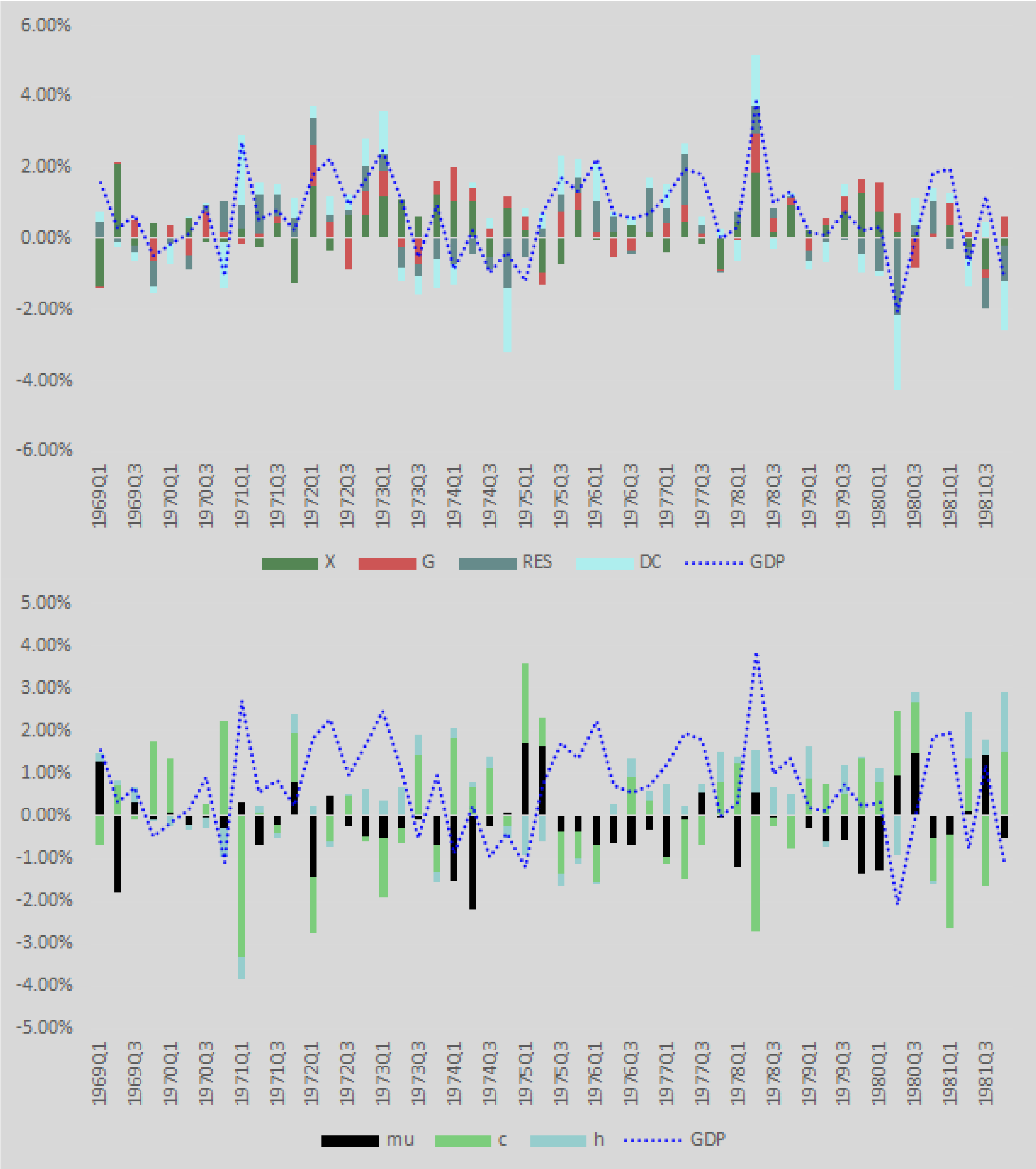
This Appendix presents a complete picture of each of the sub-periods analysed. Whereas average values of growth are presented within the Chapter, here a more detailed analysis is illustrate through a quarterly growth decomposition by component compared to the overall quarterly growth rate of output. The results presented in figures (17, 18, 19, 20, and 21) show the quarterly contribution to growth of each components in p.p. (stacked bars), which can be compared to the overall result depicted in the dashed blue line. The figures portray the quarterly contributions to growth of autonomous demand components on the top panel, whereas the contributions of the components within the multiplier are shown at the bottom.

Figure (17) **Quarterly Rate of Growth Decomposition, US, 1954–1968 (constant 2010 prices):** Dashed Blue Line Represents the Overall Quarterly Growth Rate of GDP



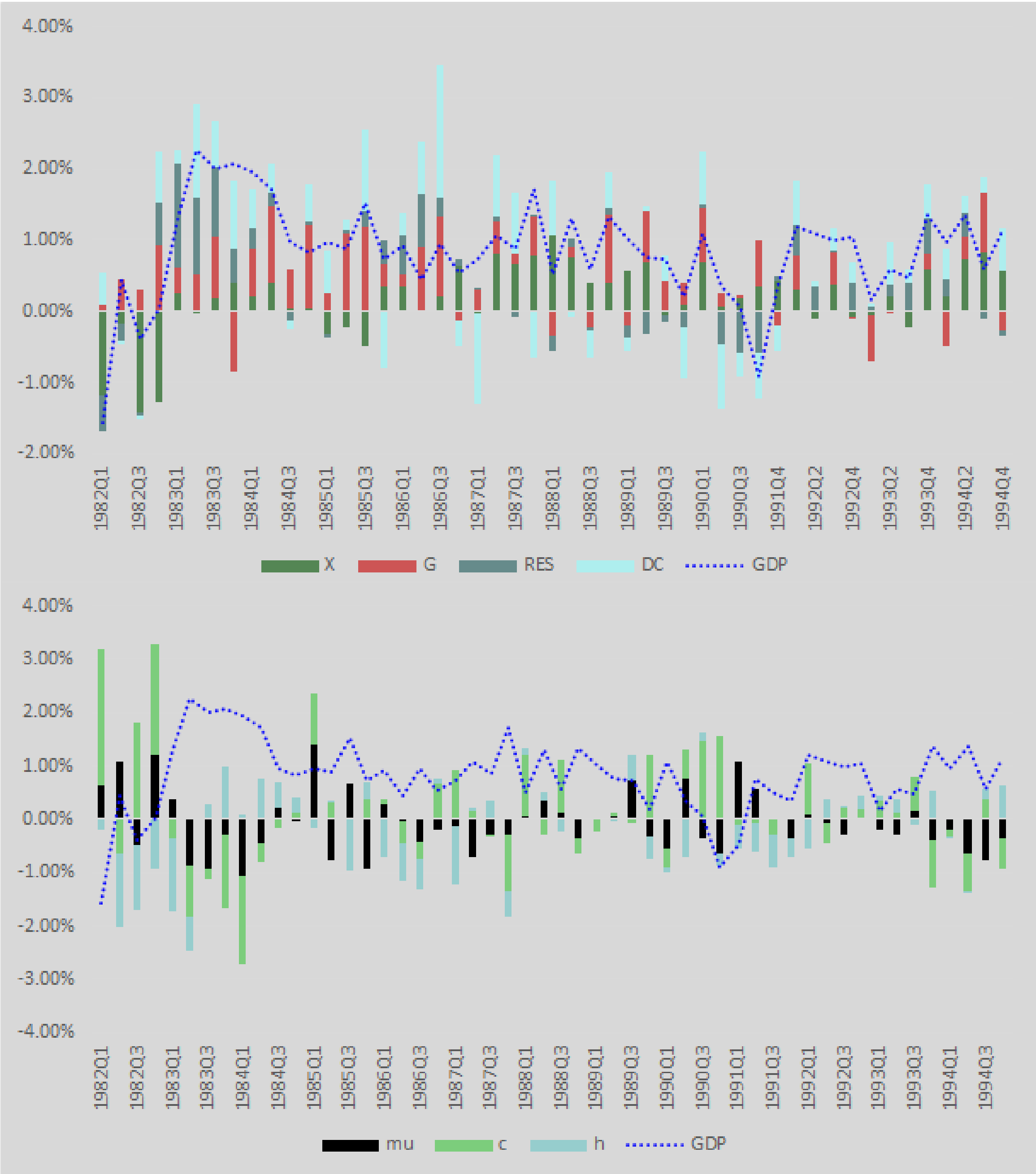
Source: Author's representation.

Figure (18) **Quarterly Rate of Growth Decomposition, US, 1969–1981 (constant 2010 prices):** Dashed Blue Line Represents the Overall Quarterly Growth Rate of GDP



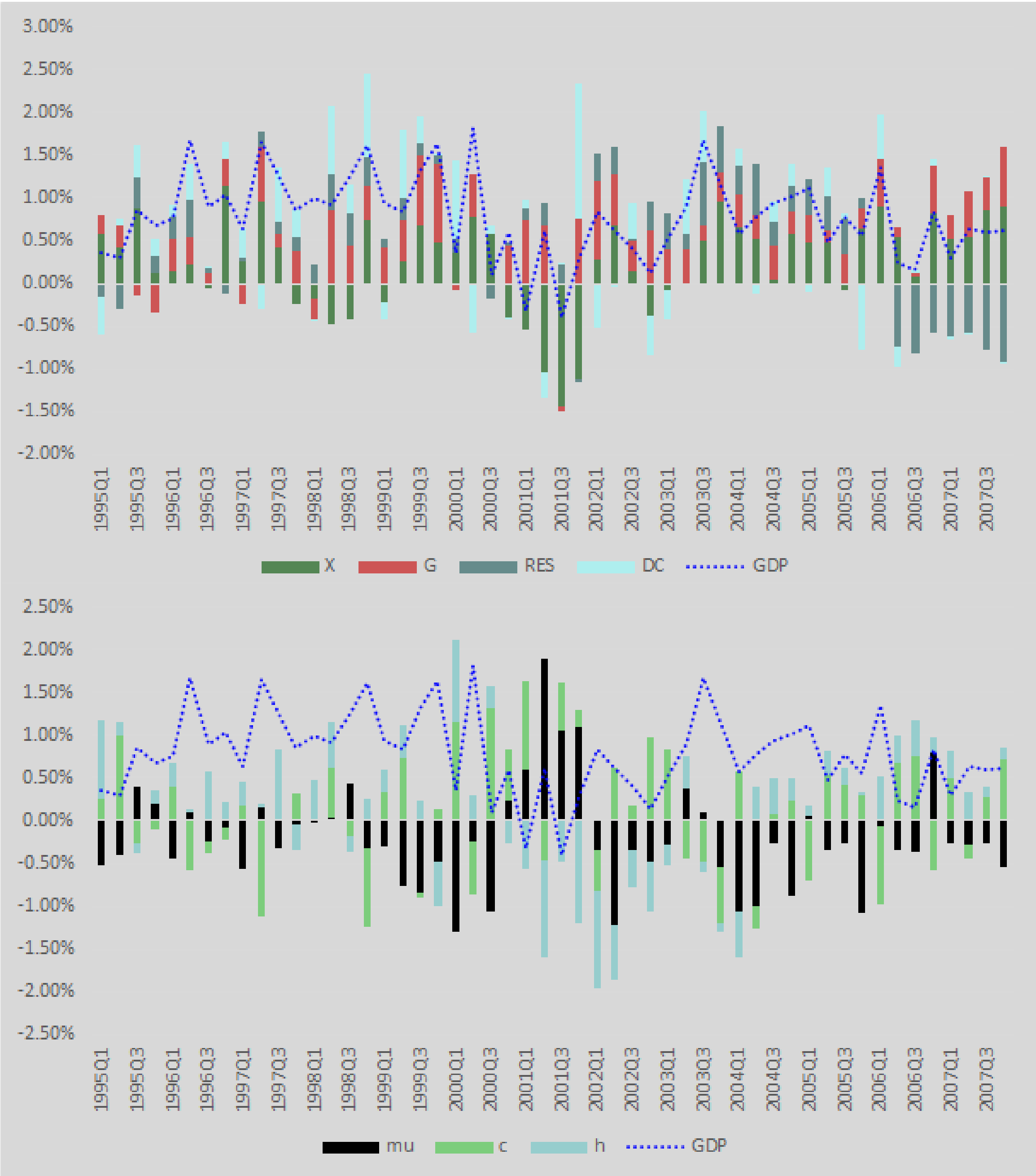
Source: Author's representation.

Figure (19) **Quarterly Rate of Growth Decomposition, US, 1982–1994 (constant 2010 prices):** Dashed Blue Line Represents the Overall Quarterly Growth Rate of GDP



Source: Author's representation.

Figure (20) **Quarterly Rate of Growth Decomposition, US, 1995–2007 (constant 2010 prices):** Dashed Blue Line Represents the Overall Quarterly Growth Rate of GDP



Source: Author's representation.

Figure (21) **Quarterly Rate of Growth Decomposition, US, 2008–2020 (constant 2010 prices):** Dashed Blue Line Represents the Overall Quarterly Growth Rate of GDP

Source: Author's representation.

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