

# SPECIAL REPORT

## TD Economics



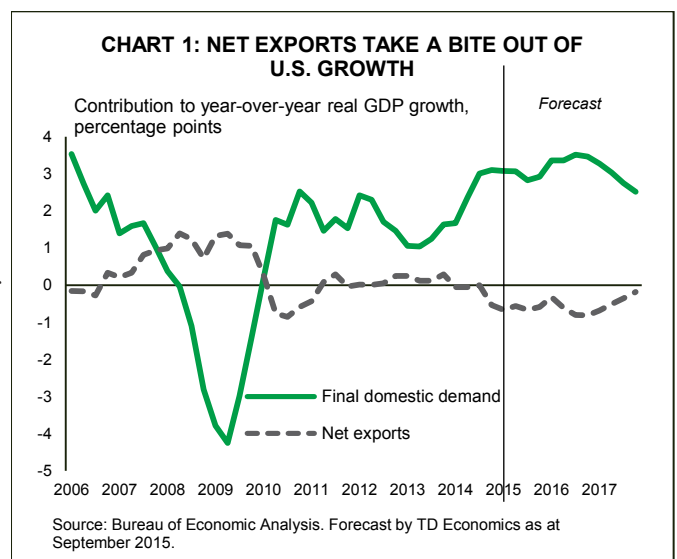
December 2, 2015

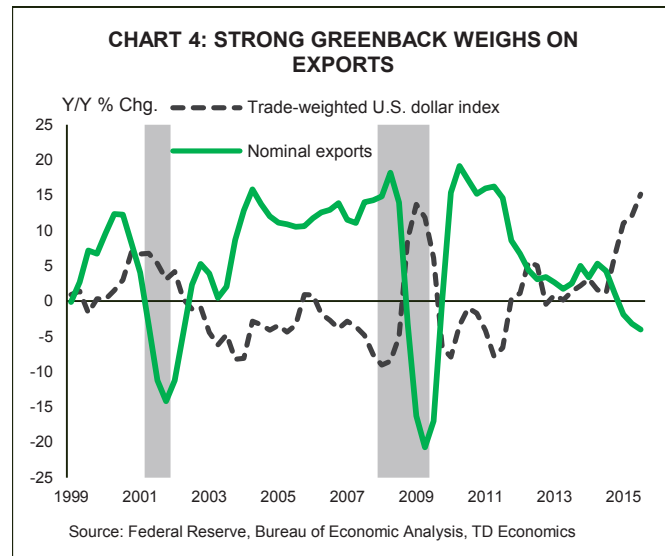
# STRONG DOLLAR BITES INTO EXPORTS, BUT IMPACT VARIES BY STATE

### Highlights

- The significant appreciation of the greenback has been a drag on the competitiveness of U.S. exports. Net exports are expected to shave 0.6ppt off GDP growth both this year and next.
- Most analysis on competitiveness and trade is done from a birds-eye view of the national economy, but the experiences vary by individual states due to differences in propensity to export, the industry composition of trade flows, sensitivities of exports to the value of the U.S. dollar, and variations in trading partners.
- We combine these three components into a single index, and use it to gauge the vulnerability of regional economies to dollar appreciation. States are ranked relative to each other and the nation.
- About one-third of U.S. states are more vulnerable to an elevated greenback relative to the nation. Those in the TD footprint include Vermont, West Virginia, South Carolina and Florida, while the rest appear more shielded.

The U.S. dollar has been gaining ground against most currencies for over a year, and the effects have not been negligible. New York Federal Reserve estimates that a sustained 10% appreciation of the trade-weighted dollar reduces exports by 2.6% over one year.<sup>1</sup> Our estimates indicate that deterioration in net exports will shave 0.6 percentage points off U.S. economic growth both this year and in 2016. The state-wide effects, however, will differ from the national impact. The economic impacts at the state level will be dependent on their individual propensity to export, their industrial composition and the geographic destination of their exports. We assess the unique sensitivities of U.S. states to the appreciation in the exchange rate by estimating an export vulnerability index for each state. Doing so revealed that the trade flows of roughly one-third of U.S. states are disproportionately negatively impacted relative to the rest of the country. The dominant influence tended to be high sensitivity related to a large share of commodity exports, with prices of globally traded commodities moving inversely with the U.S. dollar. Another common characteristic among states was a higher-than-average economic dependency to international trade, as measured by the export-to-GDP ratio.





## High-flying dollar weighs on U.S. growth

The greenback’s appreciation has been driven largely by divergent monetary policies between the U.S. and other developed countries. The Federal Reserve has long abandoned injecting additional stimulus into the economy via asset purchases (commonly referred to as quantitative easing) and is now looking to raise interest rate off the floor. In contrast, many other central banks continue to step on the monetary stimulus pedal. As a result, between July 2014 and September 2015, the real trade-weighted value of the dollar has risen by 17% (Chart 2). Both the magnitude of the increase and the speed of dollar adjustment have been a major headwind to U.S. exporters.

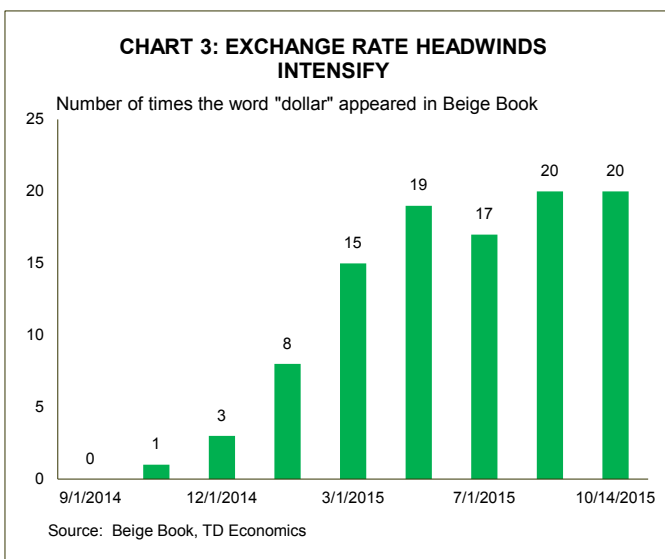
Although the dollar appreciation began more than a year

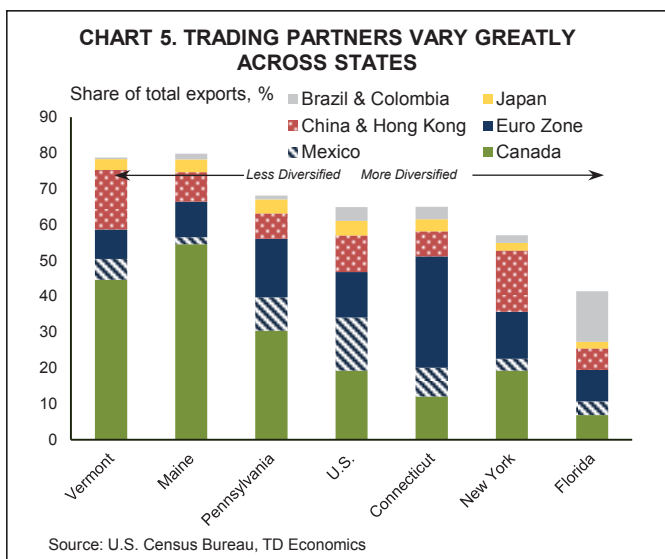
ago, the economic strain was not felt right away. Rather, the pressure intensified the higher the dollar rose and the longer it stayed elevated. This has been reflected in the Federal Reserve Beige Book – an anecdotal summary of economic conditions across Fed districts. A year ago, the word “dollar” was mentioned just once, while the more recent issue in October showed 20 mentions (Chart 3).

Over that period, inflation-adjusted exports went from being an economic outperformer with 4.3% y/y growth in 2014Q2 to being an underperformer relative to the aggregate economy with only 1.5% y/y growth in 2015Q3 (Chart 4). The manufacturing industry, which has significant exposure to international trade, has paralleled this strain. The ISM manufacturing index began to slide in December of 2014, and has been largely on a downward trend ever since. Most regional manufacturing indexes also followed suit.

## Impact differs across states

The impact of exchange rate fluctuations on the national economy can be substantial, but the impact among individual states can differ profoundly. These differences arise due to three main factors: differences in trade partners which in turn impact the magnitude of changes in a state-specific trade-weighted dollar index, the sensitivity of a state’s exports to swings in the value of the U.S. dollar, and the state’s exposure to international trade (discussed in more detail below). Constructing a single index that takes into account these three components offers insight into the potential impact exchange rate movements have on each state economy.

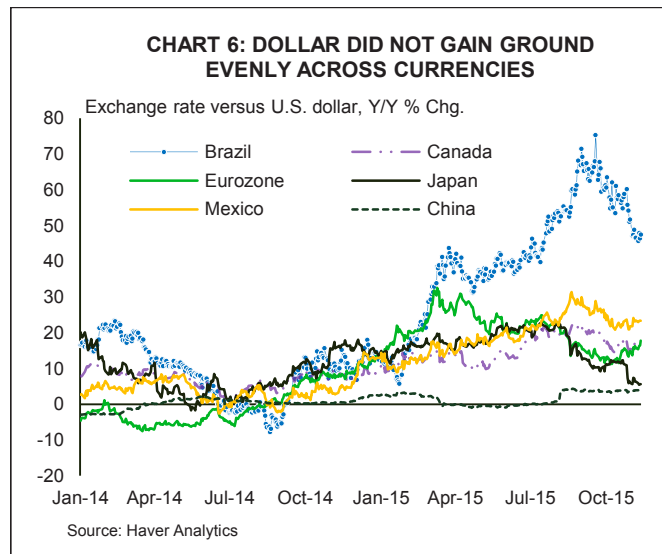




### 1. Geographic trade composition

U.S. states represent an economic mosaic, and the composition of international exports at the regional level can differ significantly from that of the nation. For example, shipments to Canada account for 31% of all Pennsylvania's exports, but represent 19% of national exports (Chart 5). Meanwhile, about a third of Connecticut's exports are destined to the Eurozone, while nationally this share is only 12.6%. The degree of trade diversification also varies greatly across states. Some states, such as Florida, have highly diversified trade flows, while others, such as Vermont and Maine, ship the bulk of their exports to a relatively small group of countries.

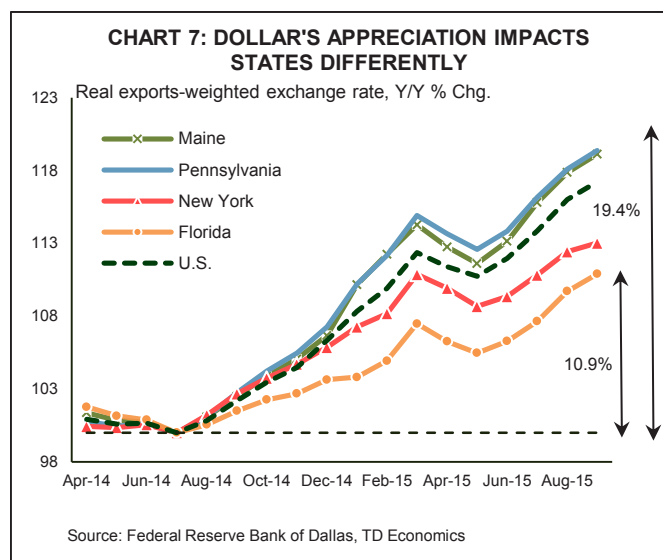
Differences in the geographic distribution of state exports are important because the dollar did not gain ground evenly across all currencies (Chart 6). The U.S. top three trading partners are Canada, Mexico, and the Eurozone. Among them, the dollar appreciation was most dramatic versus the Canadian dollar and the Mexican peso, gaining 19% and 21%, respectively. States with above-average economic ties to these countries could thus feel a disproportionate impact. But, for those states with a larger-than-average export exposure to countries like Colombia or Brazil, competitiveness would have been impacted to a much larger extent given the dollar's more dramatic rise of 43% and 47%, respectively, relative to a year ago. Meanwhile, currency movements were far more muted among America's other important trading partners, such as Japan, India and the U.K. As expected, currencies of countries which do not have a free-floating exchange rate regime, such as China



and Hong Kong, Saudi Arabia and United Arab Emirates (UAE), have remained largely unperturbed.

These nuances of state trade composition are captured by the state-specific trade-weighted dollar index (RTWD), estimated at the state-level by the Federal Reserve Bank of Dallas.<sup>2</sup> The index is computed by weighting the U.S. dollar exchange rate with various countries by the state's share of exports going to each of those destinations. The index is also a "real" measure because it is adjusted for each of the country's rates of inflation relative to the U.S.

Using the long-term data on state RTWD indexes, we find that some indexes are on average more (or less) volatile than the national index. For example, a 1% change in the national RTWD index leads to a 0.73% change in Florida's index and a 0.93% change in that of New York (Chart 7).



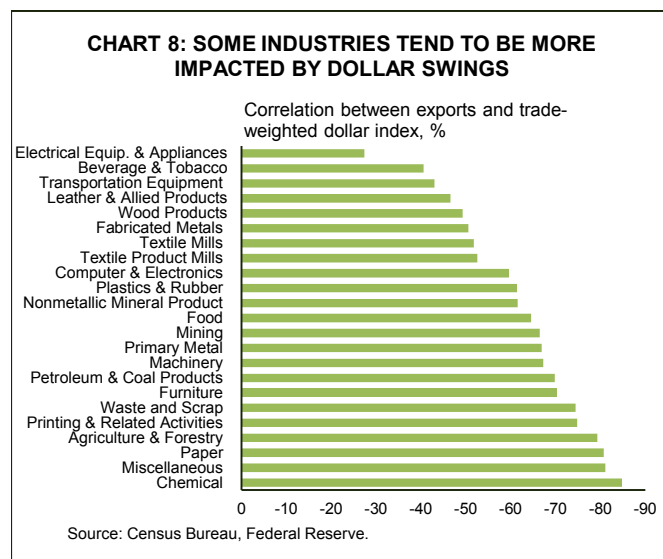
On the other hand, in Connecticut and Pennsylvania, their dollar's index tends to be more volatile, increasing by 1.08% and 1.06% for every 1% change in the national index (please see Table B in the Appendix for full list of states).

The relatively lower sensitivity in the RTWD index for Florida may come as a surprise. Florida trades extensively with Brazil, Venezuela and Colombia – countries which saw a large depreciation in the value of their currencies relative to the dollar. However, Florida's exports are highly diversified. Exports to the top five countries account for just 30% of total exports in Florida – well below the national average of 48%. Meanwhile, lower sensitivity of New York's index is due to the fact that New York trades substantially with China and Hong Kong, which do not have free-floating exchange rates.

## 2. Sensitivity of exports to exchange rate

However, regional differences go beyond geographic trade composition. States also vary in terms of their industrial composition, which in turn impacts the types of goods they export. Some export categories can be more sensitive to changes in exchange rates, an economic concept referred to as exchange rate elasticity.<sup>3</sup> This may be due to a number of factors. For instance, research has found that high performing firms<sup>4</sup>, large exporters<sup>5</sup>, and exporters of high quality goods<sup>6</sup> are more likely to absorb exchange rate movements in their mark-ups to preserve their competitive position. Meanwhile, researchers from World Bank have shown that the high share of imported content in exports corresponded to lower exchange rate elasticity.<sup>7</sup> This implies that industries which are more integrated in global supply chains and have a relatively higher share of imported content in the production of their exports will be less impacted by exchange rate movement than those that do not.

Based on estimates by the OECD, U.S. manufactured exports contain about 16% of imported content. But this varies vastly. Industries with the highest share of imported intermediate goods include refined petroleum products & nuclear fuel (39%), motor vehicles & trailers (25%), and office & computing machinery (20%). Meanwhile, industries with a below-average share of imported inputs are pulp, paper products & printing (9%), food products, beverages & tobacco products (7%), fabricated metal products (13%) and textiles & footwear (13%). High import content lowers exchange rate pass through, because of a beneficial offset through import prices. While currency appreciation



increases the relative cost of exports, it also lowers the cost of imported intermediate inputs, and these savings could be reflected in the final price. As a result, only a fraction of exchange rate appreciation is passed through to international buyers.

Looking at simple correlations between the national trade-weighted dollar index and industry-level exports, we find some support of these findings. For example, paper manufacturing industry – which has a relatively low share of imported inputs – had the highest negative correlations between the trade-weighted dollar and exports (Chart 8). However, the relationship was less clear-cut for other categories. For example, exports of chemical products include an average share of imported components. Nonetheless, they also have high exchange rate elasticity. This is also true for primary metals manufacturing.

We then proceed with statistical modelling to estimate the sensitivity of state exports to changes in the exchange rate. To do that, we measure the impact from a single quarterly increase in the dollar index over a period of four quarters (the impact nearly dissipates thereafter) on exports. Results can be seen in Table B. The top five states where exports are most sensitive to exchange rate fluctuations are Louisiana, Vermont, Florida, South Dakota, and West Virginia. Other states in the TD Footprint, where exports display above-national sensitivity to exchange rate fluctuations are Maryland, New York and Pennsylvania, and New Jersey. Among the six states mentioned, four had an above-national share of chemical exports (Md., Pa., N.J., and W.V.) and primary metal exports (Fl., N.Y., Pa., N.J.,

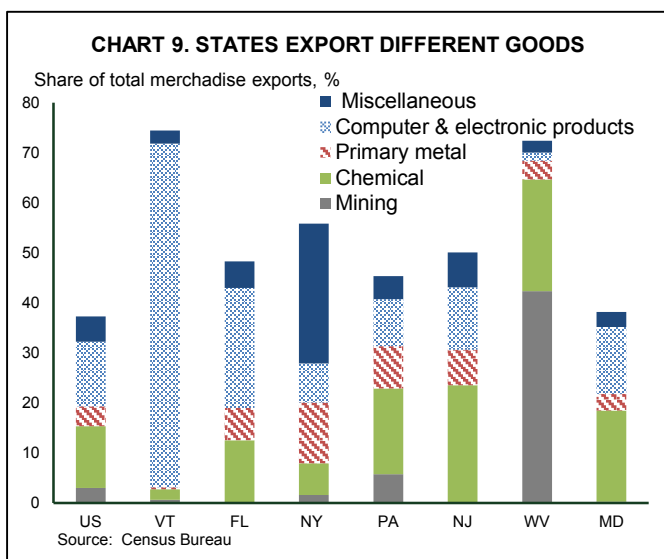
W.V.), and three had above-national share in computer and electronic products (Fl., Md., Vt.) (Chart 9). Additionally, New York has a very large share of exports labelled as miscellaneous (27% versus 5.1% nationally), which mostly includes processed diamonds, and where exports are also highly correlated with the value of dollar. However, as we show later, this is the only area where New York has above-average exposure to exchange rate movements. As a result, after putting all three index sub-components together, New York's overall rating will still remain below the national one.

### 3. Exports as a share of state GDP

Last but not least, states also differ in terms of their dependency for exports to drive economic performance, which can be gauged by looking at the export-to-GDP ratio.<sup>1</sup> For example, merchandise exports account for 16% of state GDP in South Carolina and only 6% in New York. Meanwhile, at the national level exports of goods represent approximately 9% of GDP.

Given that exports are mostly made of merchandise goods, it is not surprising that the majority of states with an above-national share of exports-to-GDP also have large manufacturing bases, such as Washington, Texas, South Carolina, Kentucky, Michigan, Indiana, and Tennessee (for full list of state see Table B). Among states in the TD footprint, only South Carolina, Vermont and West Virginia have an export base that marks an above-average share of the local economies.

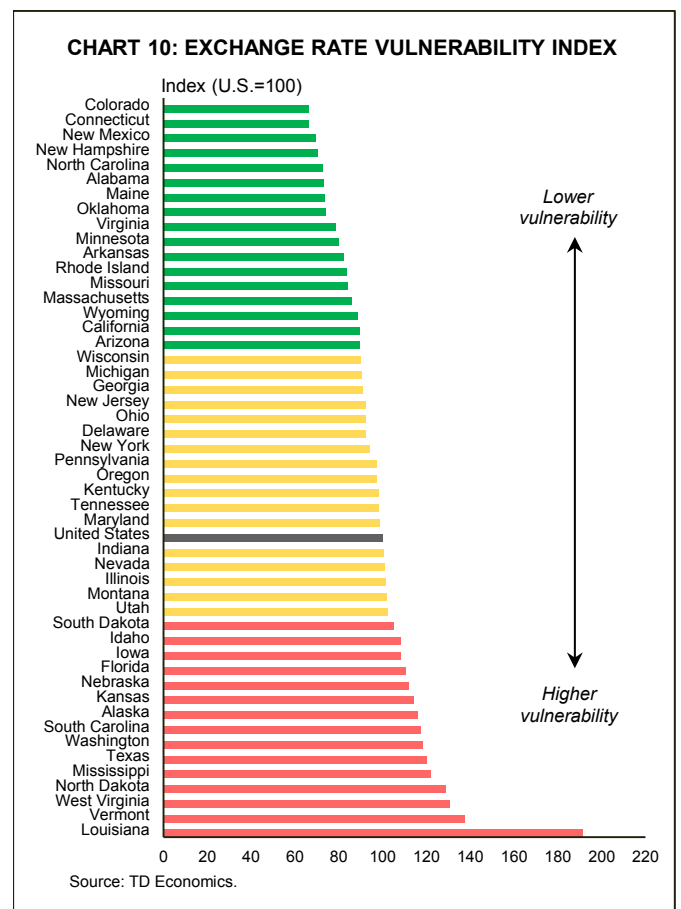
However, a significant presence of manufacturing indus-



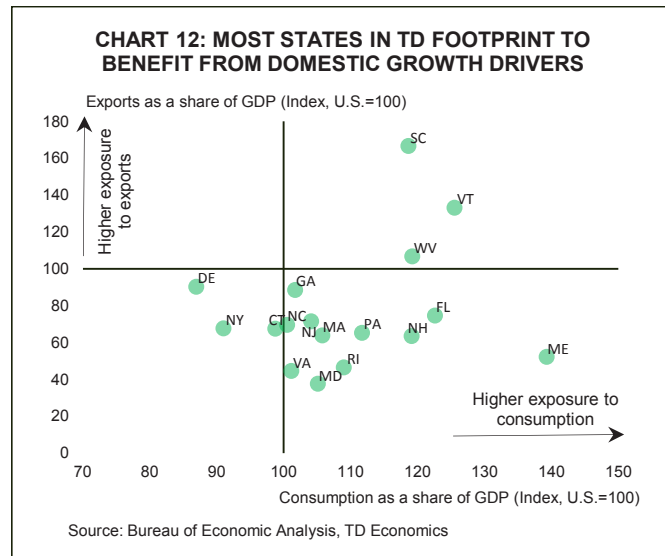
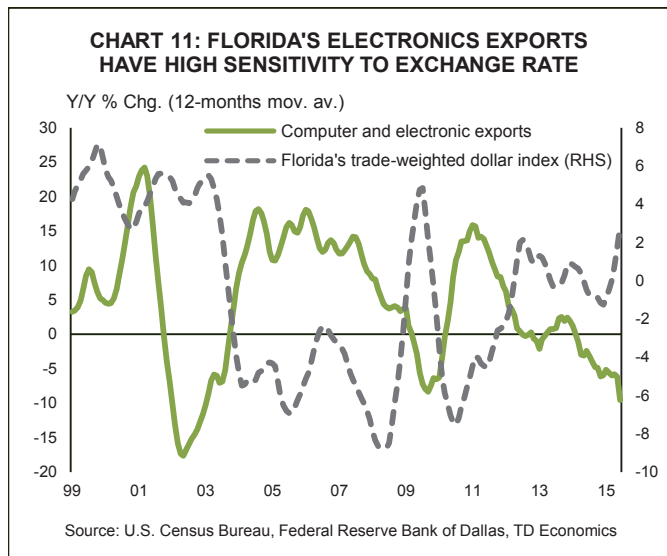
tries in the state does not automatically imply an outsized exposure to international trade since many manufacturers and some industries are oriented more toward the domestic market. For example, manufacturing accounts for nearly one-fifth of North Carolina's economy. However, nearly a quarter of that production is concentrated in food, beverage and tobacco products, and the bulk of these are sold domestically. As a result, exports account for just 6% of state GDP – 3 percentage points below the national metric.

### Bringing it altogether: Total impact

By combining the three components into a single index, we rank states based on how sensitive their economies are to the U.S. dollar appreciation (see Table A in the Appendix). States are considered to have high sensitivity if the value of their index exceeds that of the U.S. by more than 5%, i.e. those with values greater than 105. Overall there are 15 states in this category. The rest of the states have average or below-average exposure to exchange rate fluctuations, and were assigned a medium rating if their index values were between 105 and 90, and a low rating for index values less







than 90 (Chart 10 and Table A in the Appendix).

Among the states that are expected to be most impacted by dollar appreciation are several manufacturing hubs such as Louisiana, South Carolina, Mississippi, Iowa and Texas, the majority of which have an above-average propensity to export. Other states in the high-vulnerability group, such as Vermont and West Virginia, do not have a high prevalence of manufacturing, but do have an above-average propensity to export and their exports are highly sensitive to exchange rate movements. Finally, the rest of the states in this group have a relatively low reliance on trade, but their exports are highly sensitive to exchange rate gyrations. Florida is one of them. Even though it has a low exposure to international trade and its trade-weighted index is less volatile than the national one, a third of Florida's exports are made up of computer & electronic products and machinery – categories which are highly sensitive to exchange rate movements (Chart 11). The net effect amplifies the overall sensitivity of Florida's exports to the exchange rate, putting the Sunshine State 10% above the U.S. in terms of its overall sensitivity to greenback appreciation.

Does this finding mean that we expect Florida's economy to underperform the nation? No, in fact we expect the opposite, with real GDP growth likely to outperform the U.S. by 1 percentage points in 2016. That's because it's important to look at an economy holistically. Despite the headwinds emanating from the elevated greenback, the Sunshine State remains a consumption-oriented economy. Consumer spending accounts for over 85% of its GDP, which is a whopping 15 percentage points more than the nation. Robust domestic spending, together with a strength-

ening housing recovery and fast population growth will help Florida to outperform the nation over the next two years. South Carolina's economy is more externally-oriented and so the headwinds from trade sector will be more material, with economic growth in the Palmetto State decelerating to slightly below that of the U.S. in 2016 and 2017. However, the slowdown in the exports sector will be most trying for Vermont. It is not only that it has the highest vulnerability score among the three states, which is in large part due to a highly undiversified export profile (with 70% of its exports concentrated in computer & electronic products), but Vermont also lacks the dynamism of the Florida and South Carolina economies. Last year, Vermont's GDP advanced by just 0.6%, and growth will remain subdued over the next two years.

The drag from the slowdown in the manufacturing and the trade is expected to be below-national in the Middle Atlantic region. However, with both New Jersey and Pennsylvania economies already underperforming relative to the nation, this relatively smaller exposure could be of little consolation to them.

**Bottom Line**

The Federal Reserve remains on track to raise rates, diverging from many other central banks which continue to beef up their monetary stimulus programs. This means that the dollar will maintain an undercurrent of strength, challenging the competitiveness of U.S. manufacturers. The dollar's strength compounds the headwinds faced by some manufacturing industries that were already underperforming for structural reasons, such as those in the Northeast region.

That being said, many states in the TD Footprint are under-exposed to both international trade and manufacturing, thereby stemming the drag to their respective economies relative to the nation. Furthermore, while the dollar is expected to remain elevated through 2016 and 2017, the bulk of ramp-up in value is in the rear-view mirror. As mentioned earlier, the impact of dollar increase on exports tends to compound over time, however, this does not continue indefinitely. Additional quarterly effects from a one-time increase in the value of the dollar become relatively negligible after about a year. With the dollar expected to begin to ebb lower in the second half of 2016, the drag from an exchange rate shock on exports is likewise expected to stabilize.

Last but not least, some of the weakness in external demand could be mitigated by strength in domestic consumption, which will continue to be supported by steady improvements in the labor market, decent income growth as well as savings at the pump. Consumer spending accounts for nearly 70% of national output, and plays an even bigger role in many regional economies. Unsurprisingly, states which have below-national exposure to international trade and where consumption represents an above-average share of GDP will benefit the most from these trends. These are the states in the lower right quadrant on Chart 12. Because of their under-exposure to trade, the majority of states in the TD footprint will be included in this group.

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Table A: Exchange Rate Vulnerability Index	
State	Composite Index** (SORTED)
Louisiana	191.4
Vermont	137.6
West Virginia	130.9
North Dakota	129.2
Mississippi	122.3
Texas	120.1
Washington	118.5
South Carolina	117.6
Alaska	116.3
Kansas	114.4
Nebraska	112.1
Florida	110.6
Iowa	108.3
Idaho	108.3
South Dakota	105.1
Utah	102.3
Montana	102.0
Illinois	101.6
Nevada	100.9
Indiana	100.6
<b>United States</b>	<b>100.0</b>
Maryland	98.6
Tennessee	98.4
Kentucky	98.2
Oregon	97.5
Pennsylvania	97.3
New York	94.4
Delaware	92.7
Ohio	92.6
New Jersey	92.4
Georgia	90.8
Michigan	90.4
Wisconsin	90.0
Arizona	89.8
California	89.6
Wyoming	88.8
Massachusetts	86.0
Missouri	84.3
Rhode Island	83.6
Arkansas	82.3
Minnesota	80.3
Virginia	78.9
Oklahoma	74.1
Maine	74.0
Alabama	73.0
North Carolina	72.7
New Hampshire	70.6
New Mexico	69.9
Connecticut	66.6
Colorado	66.4

\*\* Calculated as a weighted average of the three sub-components with equal weights  
Source: TD Economics.

Table B: Exchange Rate Vulnerability Index					
State	Sensitivity of state RTWD index*	Exports-to-GDP ratio	Exports-to-GDP ratio (standardized)*	Sensitivity of exports to exchange rate*	Composite Index**
	[1]		[2]	[3]	
Alabama	105.6	9.7%	104.5	9.1	73.0
Alaska	107.2	8.7%	93.4	148.5	116.3
Arizona	105.3	7.5%	80.2	83.8	89.8
Arkansas	98.6	5.6%	60.3	87.9	82.3
California	100.8	7.5%	80.6	87.5	89.6
Colorado	108.1	2.7%	29.1	61.9	66.4
Connecticut	107.6	6.3%	67.5	24.8	66.6
Delaware	91.1	8.4%	90.2	96.6	92.7
Florida	72.8	7.0%	74.6	184.5	110.6
Georgia	97.6	8.3%	88.6	86.3	90.8
Idaho	94.5	8.1%	86.7	143.6	108.3
Illinois	107.7	9.2%	98.1	98.9	101.6
Indiana	107.2	11.2%	119.6	75.0	100.6
Iowa	111.4	8.8%	94.7	118.8	108.3
Kansas	108.0	8.2%	87.8	147.5	114.4
Kentucky	107.3	14.7%	157.1	30.2	98.2
Louisiana	84.1	26.0%	278.6	211.5	191.4
Maine	98.7	4.9%	52.2	71.0	74.0
Maryland	98.4	3.5%	37.6	159.8	98.6
Massachusetts	103.3	6.0%	63.8	90.8	86.0
Michigan	102.7	12.4%	133.0	35.5	90.4
Minnesota	109.7	6.8%	72.6	58.6	80.3
Mississippi	84.5	10.9%	117.2	165.3	122.3
Missouri	105.2	5.0%	53.3	94.3	84.3
Montana	100.7	3.5%	37.4	168.0	102.0
Nebraska	115.8	7.0%	75.0	145.5	112.1
Nevada	99.4	5.8%	62.5	140.8	100.9
New Hampshire	103.3	5.9%	63.5	44.9	70.6
New Jersey	101.0	6.7%	71.5	104.8	92.4
New Mexico	102.5	4.1%	43.6	63.6	69.9
New York	93.4	6.3%	67.6	122.2	94.4
North Carolina	88.5	6.5%	69.6	59.9	72.7
North Dakota	113.9	10.0%	106.9	166.8	129.2
Ohio	107.4	8.9%	95.9	74.5	92.6
Oklahoma	96.9	3.4%	36.9	88.5	74.1
Oregon	92.3	9.7%	103.8	96.6	97.5
Pennsylvania	105.6	6.1%	65.2	121.3	97.3
Rhode Island	104.4	4.3%	46.5	99.8	83.6
South Carolina	102.7	15.5%	166.7	83.5	117.6
South Dakota	100.1	3.5%	37.2	177.9	105.1
Tennessee	101.9	11.0%	117.5	75.7	98.4
Texas	97.3	17.5%	187.5	75.7	120.1
Utah	102.6	8.6%	92.6	111.6	102.3
Vermont	88.9	12.4%	133.1	190.8	137.6
Virginia	101.1	4.2%	44.5	91.2	78.9
Washington	91.1	21.2%	227.2	37.3	118.5
West Virginia	110.4	9.9%	106.6	175.8	130.9
Wisconsin	103.8	8.0%	85.8	80.3	90.0
Wyoming	117.3	3.9%	42.3	106.8	88.8
<b>United States</b>	<b>100.0</b>	<b>9.3%</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\* Values above 100 indicate above-national vulnerability  
\*\* Calculated as a weighted average of the three sub-components with equal weights  
Source: TD Economics.



## Endnotes

- i. This measure has one limitation – state export data only captures trade in merchandise goods and does not include services, which could be a substantial trade component for some states, such as Massachusetts, New York, and Florida. Nonetheless, in the absence of alternative data we must rely on this metric.

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