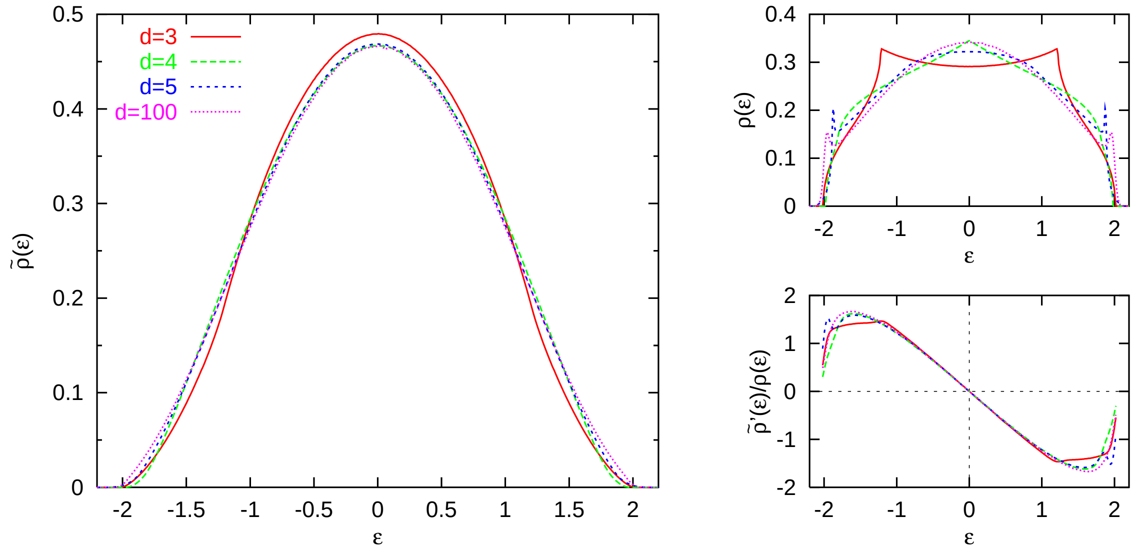

Figure 4.15: DMFT transport characteristics of the hc lattice with 3rd NN hopping (analogous to Fig. 4.14). $\tilde{\rho}(\epsilon)$ changes much less with dimension d that the DOS, in particular for $d \geq 4$.

on local properties, are small even for d, $D_{\max} \lesssim 10$. Thus, the model relies much less on extremely high dimensionality than, e.g., the $d = \infty$ fcc lattice. We will now extend the discussion to transport related properties.

In Fig. 4.15, the analogue of Fig. 4.14 is shown for the redefined Bethe lattice with the hopping range truncated at $D_{\max} = 3$ and for a range of dimensions $3 \leq d \leq 100$. Evidently, $\tilde{\rho}(\epsilon)$, the lattice input for $\sigma(\omega)$, is hardly affected by a change of dimension, in particular for $d > 3$. The differences are even much smaller for $\tilde{\rho}(\epsilon)$ than for the DOS $\rho(\epsilon)$ since Van-Hove singularities in the DOS for some energy ϵ^* are cancelled by a corresponding dip in the average squared Fermi velocity $\langle |\boldsymbol{v_k}|^2 \rangle(\epsilon^*)$. As we will see below, this behavior is very general so that results for $\sigma(\omega)$ of a local theory in finite dimensions will depend on d predominantly via $A(\omega)$, the interacting DOS, and only very little via $\tilde{\rho}(\epsilon)$. From comparing the main panels of Fig. 4.14 and Fig. 4.15, we also see that the impact of the truncation to $D_{\max} = 3$, i.e., only two nonvanishing scaled hopping matrix elements, is typically much smaller than 10%. As seen in the lower right part of Fig. 4.15, the function $\tilde{\rho}'(\epsilon)/\rho(\epsilon)$ entering the f-sum rule (4.95) converges fast for $d > 3$; the spikes near the band edges are due to numerical errors. With the inclusion of 5th-nearest-neighbor hopping, effects of finite dimensionality (for $d \geq 5$) on $\tilde{\rho}(\epsilon)$ become almost invisible as seen in Fig. 4.16. Also the effect of truncation is further reduced.

In conclusion, the results of this subsection demonstrate that the transport properties derived for the redefined Bethe lattice within the general dispersion formalism for $d = \infty$ are not specific to very high dimensions or to infinite hopping range. Instead, a local theory of transport, i.e., usage of a local self-energy and of the bubble approximation, applied in finite dimensions for models with similar hopping elements